



Airspace Technology Demonstration 2 (ATD-2)

Understand and Process ATC Restrictions in the National Airspace System

April 25, 2018

Bob Staudenmeier

- Keep broad group of ATD-2 stakeholders informed of progress in an inexpensive and unobtrusive manner
- Demonstrate actual system capability and lessons learned (as opposed to documents/plans)
- Take input from stakeholders that can be used to improve the ATD-2 system, processes and/or outreach
- Identify areas where more detailed discussion is desired/warranted

Go to https://www.aviationsystemsdivision.arc.nasa.gov/research/tactical/atd2_remote_demos.shtml
to learn about upcoming ATD-2 remote demos!

ATD-2 Remote Demos

To Join...

1. Go to: <https://ac.arc.nasa.gov/atd2/>
Enter as a guest and type your name. NASA Employees can log-in with their email and password (NDC Credentials).
2. Dial the Telecon Number: **1-844-467-6272, Passcode: 592382#**

Demo Objectives

- Keep broad group of ATD-2 stakeholders informed of progress in an inexpensive and unobtrusive manner
- Demonstrate actual system capability and lessons learned (as opposed to documents/plans)
- Take input from stakeholders that can be used to improve the ATD-2 system, processes and/or outreach
- Identify areas where more detailed discussion is desired/warranted

Upcoming Demos

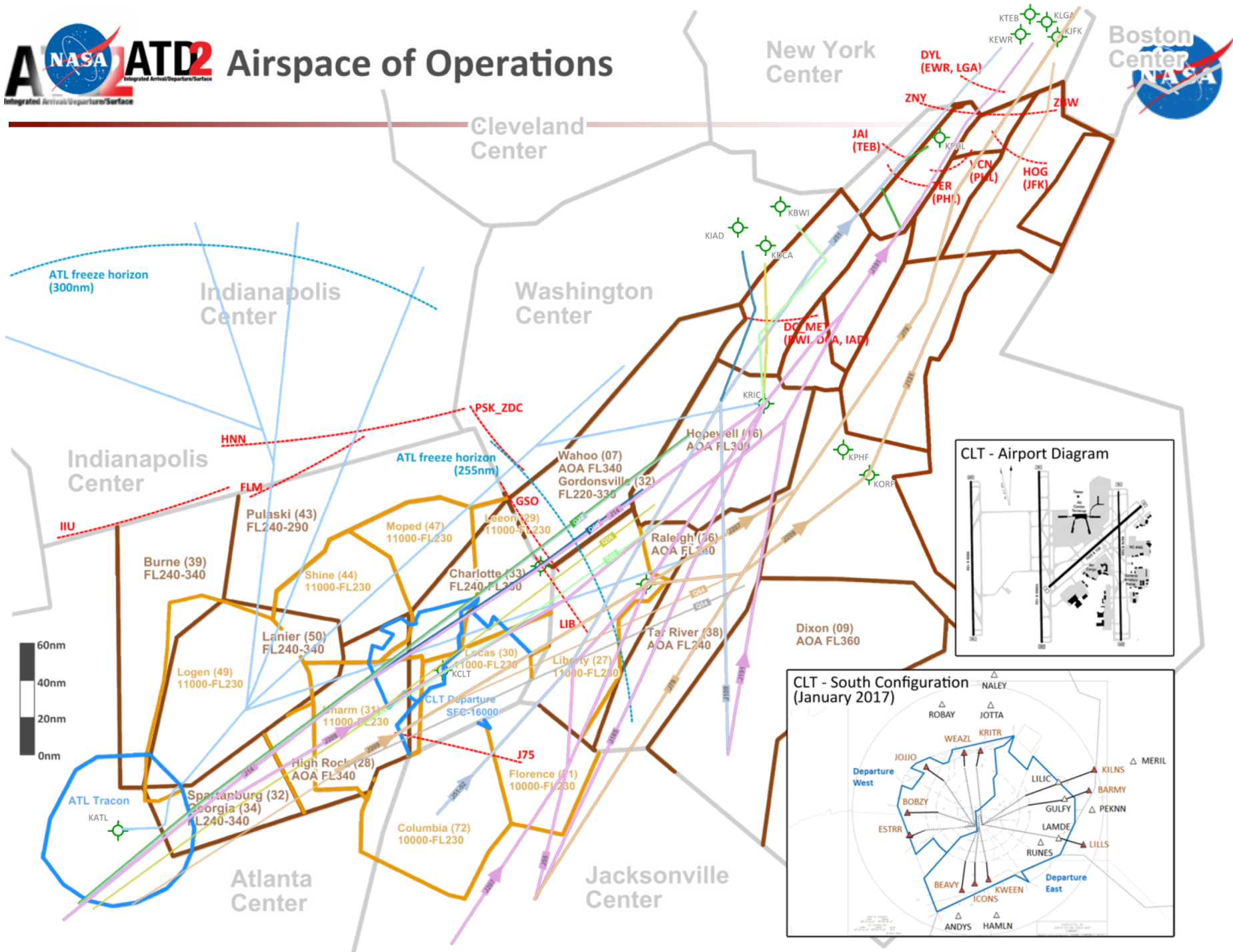
Latest IADS capabilities
Surface Metering - Initial Analysis, Impact, and Evolution

Mar. 14, 8:00-9:30 PT
Mar. 21, 8:00-9:30 PT

- The audio and video from this demo are being recorded



**RECORDING
IN PROGRESS**



Misc

RSTN

MRSTN

Delay

RWY

Sum

EQ

Log

MyEntry

SISO

Count

ICE

INFO

MA

PIREP

SUA

SWAP

Telcon

Pending

Request Type: ☒ Initiate ☐ Modify ☐ Cancel ☐ Delete

Entry Time: 1936

☒ Clear on Submit

Type: MMT:

Aircraft Type:

☒ All ☐ Jet ☐ Prop ☐ Other:

Requesting: ZTL

Providing ():

Start Time: End Time:

Causal Factor...

Altitude:

Speed:

Qualifier (): NONE

Exclusions:

☐ Severe Weather Reroute

Restriction:

☒ En Route ☐ Departure ☐ Arrival

Airport ():

Via (): WHITE

Location ():

Justification/Remarks:

ATCSCC Remarks/Critique:

Send To...

ESIS:

Coordination Complete ☐

Pos:

Reminder (Z):

Fac:

Entry #:

Submit

Spelling

Clear

Save As

TPCOPS

Pending: 5 / 1

1015	ZDC/CP	LGA Arivl via RBV 15 Mit 1100-0200, VOL:Arrival Demand N90:ZDC, RSTN: APVD 1013/DCC:NE/JM - LNK: LGA - ESIS:	NN
------	--------	--	----

1038	ZDC/CP	LGA EnRte via J14,Q60 30 Mit JETS AS ONE RTE, FEA_ZTL 1200-1500, VOL:Volume ZDC:ZTL, RSTN: APVD 1037/DCC:NE/JM - LNK: LGA - ESIS: CP,Bay2,Bay5	NN
------	--------	---	----

1411 GI E2 ATTN FLM/CIC/SCTRS/TWRS. APREQ JETS/PROPS TO THE FOLLOWING
DESTINATIONS XXX XXXX-XXXXZ WITH ZDC... IDAC TWRS CALL FOR RELEASE
TMU

Count

Delay

EQ

ICE

INFO

MA

Misc

MRSTN

MyEntry

PIREP

RSTN

RWY

SISO

SUA

Sum

SWAP

Telcon

Log

Pending

00



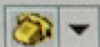
Benjamin Dengler

Request Type: ☒ Initiate ☐ Modify ☐ Cancel ☐ Delete

Entry Time: 1657

☐ Clear on Submit

Type:



APREQ:

Aircraft Type:

☒ All ☐ Jet ☐ Prop ☐ Other:

Requesting: ZDC

Providing (/): ZTL/CLT

Start Time:

End Time:

Causal Factor...

Restriction:

☐ En Route☒ Departure☐ Arrival

Altitude:

Speed:

Airport (/):

Qualifier (/): NONE

Via (/): BARMY/KILNS

Exclusions:

Location (/):

☐ Severe Weather Reroute

Justification/Remarks:

PLEASE APREQ WITH ZDC

ATCSCC Remarks/Critique:

Send To...

ESIS:

Coordination Complete ☐

Pos:

Reminder (Z):

Fac:

Entry #:

1016 ZDC/CP APREQ: CLT,ZTL to LGA via BARMY,KILNS, PLEASE APREQ WITH ZDC NN
ESP. THANKS
1030-0200, VOL:Volume
ZDC:CLT,ZTL, APREQ: - LNK: LGA,CLT

APREQS ATL 0248 BWI 1210-0210 CLT J/P 0248 DCA 0210 C/G EWR J/P 0900 C/G IAD 2200 JFK 0900 LGA 0900 C/G PBI ARS 2000	RESTRICTION ATL 02221 20MIT RALT 1700-1900 ZTL:ZDC ATL J48 20MIT RALT 1615-1900 ZDC:ZNY CLT J75 10MIT JETS 1600-1915 ZDC:ZNY DCA ZDC14 15MIT JETS 1815-1945 PCT:ZDC DCA Q56 30MIT 1745-1900 ZDC:ZTL DCA J165 30MIT 1800-1900 ZDC:ZJX EWRJATS JAIKE 25MIT 1700-0000 PHL:ZDC EWR CAE.FLO 20MIT JETS AS ONE 1630-2000 ZDC:ZIX IAD ZDC15 15MIT JETS 2000-2100 PCT:ZDC IAD MCW 20MIT JETS 1940-2100 ZDC:ZOB IAD ZDC02 10MIT JETS 2000-2100 PCT:ZDC IAD HVQ 15MIT SINGLE STREAM ALT: AOB 330 1930-2045 ZDC:ZID LGA RSV 15MIT 1200-0300 N90:ZDC PBI ARS 15MIT 1915-2000 ZJX:ZDC	NSA/SNIAP/OVERFLOW DCA SWANN.PALEO.AGARD.COLIN 15MIT 1100-0530 PCT:DCA:ZDC BWR COLIN 15MIT 1100-0530 PCT:BWR:ZDC IAD JCOBY 15MIT 1100-0530 PCT:IAD:ZDC WHITE 15MIT JETS 1315-2100 ZDC:ZNY WAVEY 15MIT JETS 1330-2100 ZDC:ZNY PHL SATS OOD 20MIT JETS AS ONE ARPT EXCL: ORF/RIC/ B24 1900-1900 ZDC:PHL ZBW TO ZDC WESTCST FLA VIA J75 /0200 COLIN 25MIT JETS PER ARPT EXCL: ADC LTFC 1637-2000 ZDC:PCT RERTE 1830-2130 NO AR6/15/17 OR HIBAC TRANSITION FOR A ROCKET LAUNCH TO THE FOLLOWING: MCO ORL ISM/SFB/TPA/SRQ/PIE/MCF/LAL/TPF/SPG/GIF/RSW/FMY/APF/MKY
METERING CLT 1200-0300 EWR 1600-1729 S EWR 1730-0300		GDP/APP SFO 1600 0759 WEATHER / WIND GROUNDSTOPS GS ALL ARR ATL 1702-1815 WEATHER / THUNDERSTOR..
MISC. NMK ACTIVE AOB FL400		

NTML: DCC TMU01 05 Nov 2008 1936

Options Edit View Tools Information Print Reports Link Search Help

Misc
RSTN
MRSTN
Delay
RWY
Sum
EQ
Log
MyEntry
SISO
Count
ICE
INFO
MA
PIREP
SUA
SWAP
Telcon
Pending

Request Type: ☒ Initiate ☐ Modify ☐ Cancel ☐ Delete

Entry Time: 1936 ☐ Clear on Submit

Type: MT:

Aircraft Type:
☒ All ☐ Jet ☐ Prop ☐ Other:

Requesting:

Providing (I):

Start Time: End Time:

Restriction:
☒ En Route ☐ Departure ☐ Arrival

Airport (I):

Via (I): WHITE

Location (I):

Originator:

Approval: ☒ Approve ☐ Disapprove

Causal Factor...

Altitude:

Speed:

Qualifier (I): NONE

Exclusions:

☐ Severe Weather Reroute

Justification Remarks:

ATCSCC Remarks/Critique:

Send To... ESIS:

Pos:

Fac:

Coordination Complete ☐

Reminder (Z):

Entry #:

Submit Spelling Clear Save As

TPCOPS Pending: 5 / 1



**ATCSCC
OIS
SYSTEM**

3/29/2018

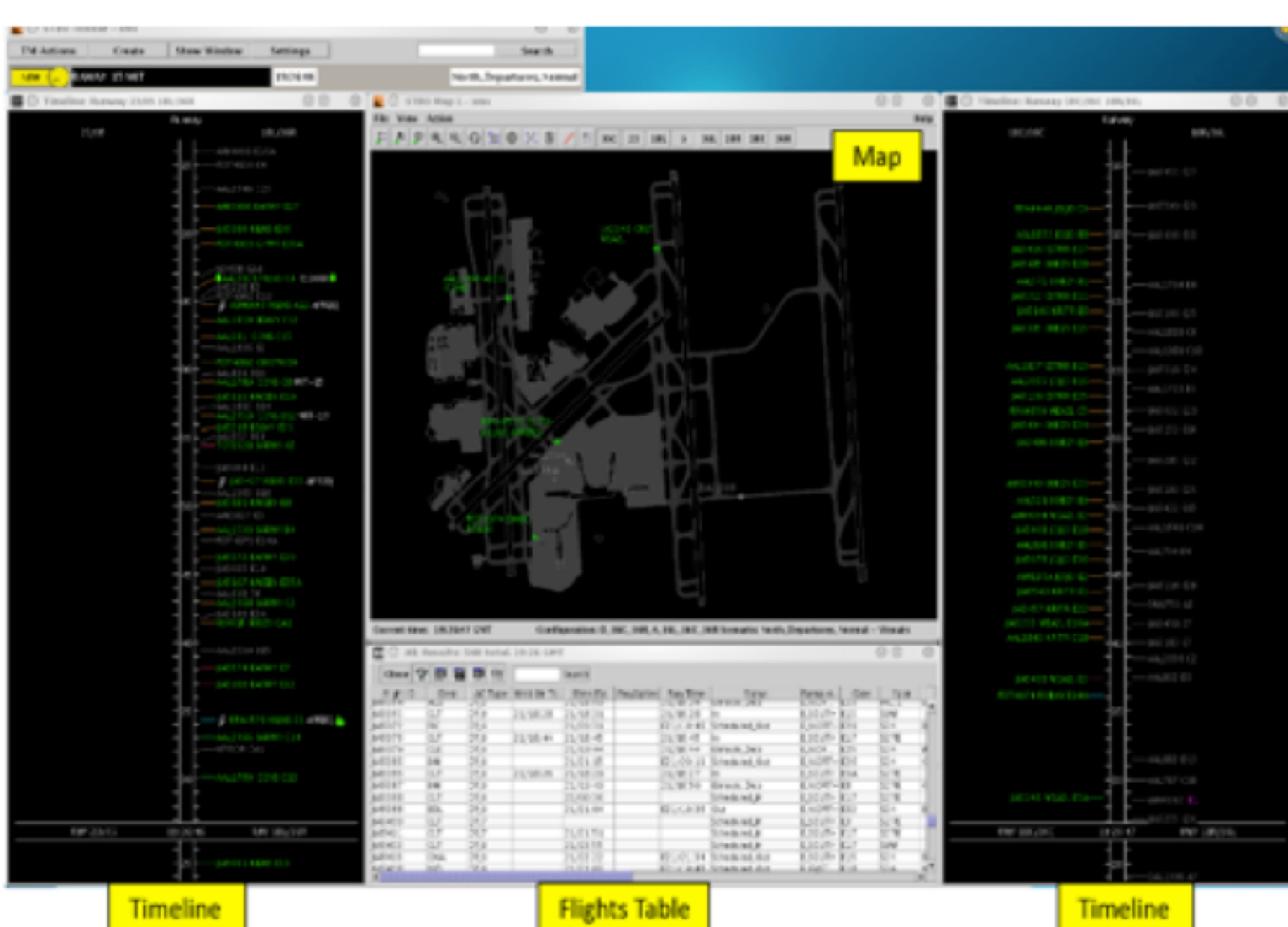
OIS Main Menu

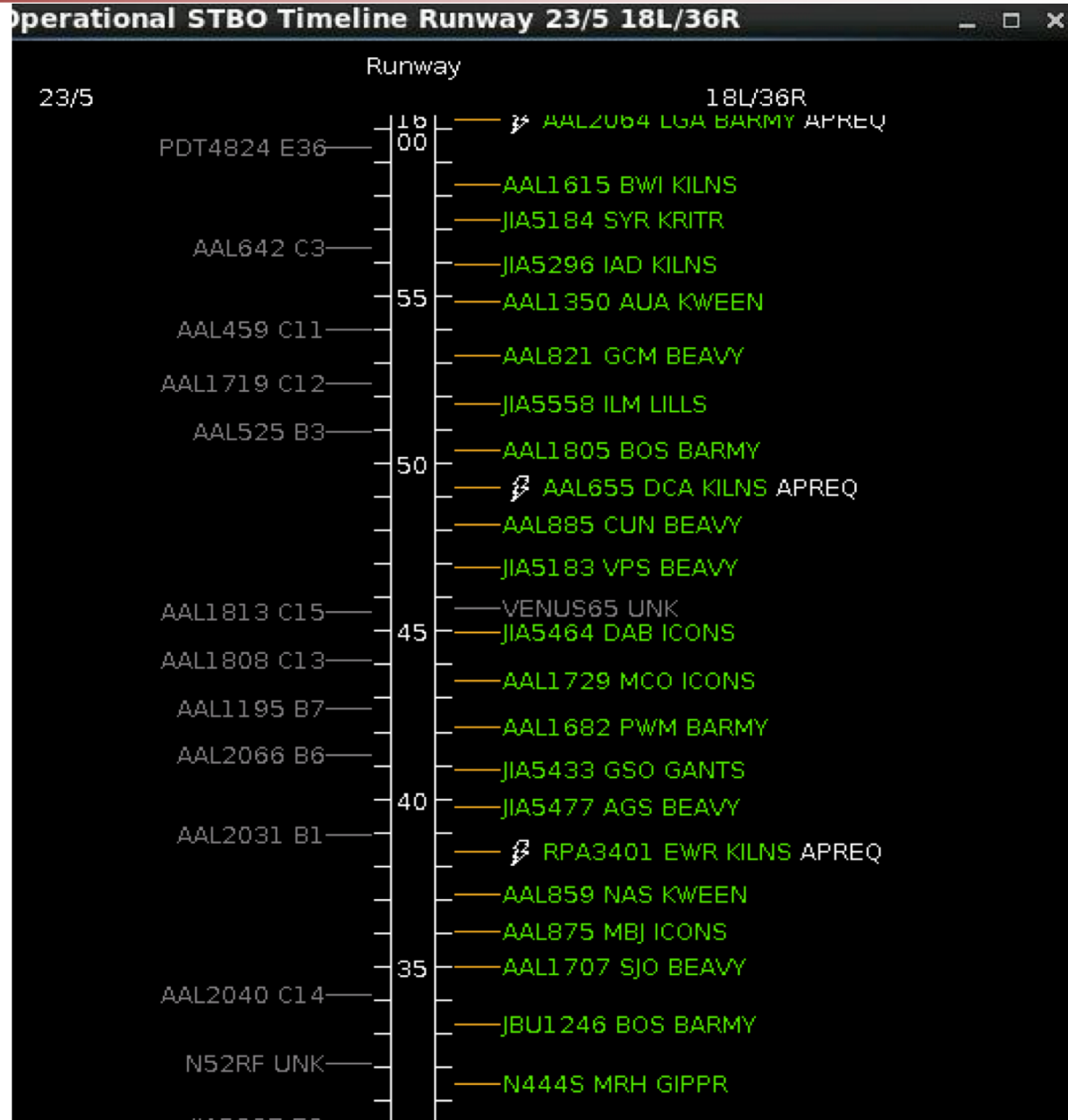
- ⊕ [NAS Status](#)
- ⊕ [Int'l Status](#)
- ⊖ [East Directory](#)
- ⊕ [ZBW](#)
- ⊖ [ZDC](#)
- [BWI](#)
- [DCA](#)
- [IAD](#)
- [RDU](#)
- ⊕ [ZID](#)
- ⊕ [ZJX](#)
- ⊕ [ZMA](#)
- ⊕ [ZNY](#)
- ⊕ [ZOB](#)
- ⊕ [ZSU](#)
- ⊕ [ZTL](#)
- ⊕ [West Directory](#)

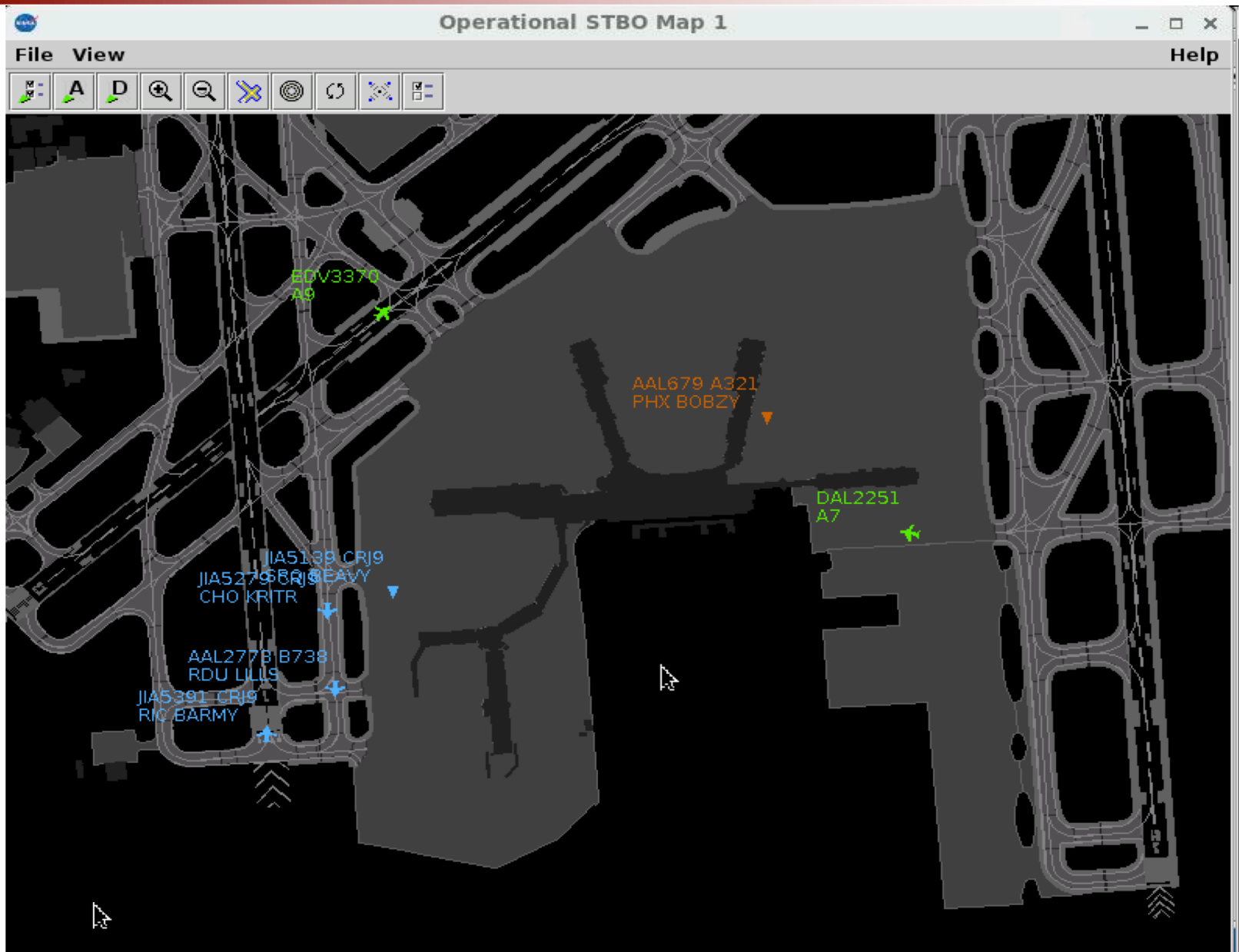
Current Restrictions

This page refreshes every minute. Last updated Thu, 29 Mar 2018 13:52:34 UTC

REQUESTING	PROVIDING	RESTRICTION	START TIME	STOP TIME
ZDC	CLT/ZTL	APREQ CLT,ZTL to DCA via BARMY,KILNS JETS 1030-0130 ZDC:CLT,ZTL	03/29/2018 1030	03/30/2018 0130
ZDC	CLT/ZTL	APREQ CLT,ZTL to EWR via BARMY,KILNS JETS 1100-0130 ZDC:CLT,ZTL	03/29/2018 1100	03/30/2018 0130
ZDC	CLT/ZTL	APREQ CLT,ZTL to LGA via BARMY,KILNS JETS 1100-0130 ZDC:CLT,ZTL	03/29/2018 1100	03/30/2018 0130
ZDC	PCT	BWI GVE 20MIT JETS EXCL: SBV 1250-1800 ZDC:PCT	03/29/2018 1250	03/29/2018 1800
ZDC	PCT	BWI OTTTO 15MIT JETS 1145-1500 ZDC:PCT	03/29/2018 1145	03/29/2018 1500
ZDC	PCT	COLIN 20MIT JETS PER ARPT EXCL: ZDC LTFC 1200-1500 ZDC:PCT	03/29/2018 1200	03/29/2018 1500
ZDC	PCT	DCA,IAD GVE 15MIT JETS AS ONE ARPT EXCL: SBV 1250-1800 ZDC:PCT	03/29/2018 1250	03/29/2018 1800
ZDC	PCT	DCA,IAD OTTTO 10MIT JETS AS ONE ARPT 1145-1500 ZDC:PCT	03/29/2018 1145	03/29/2018 1500
ZDC	PHL	PHL,SATS OOD 20MIT JETS AS ONE ARPT EXCL: ZDC LTFC / B24 1200-1530 ZDC:PHL	03/29/2018 1200	03/29/2018 1530
ZDC	ZBW	DCA ZIZZI 20MIT JETS 1030-1445 ZDC:ZBW	03/29/2018 1030	03/29/2018 1445
ZDC	ZID	DCA BKW 20MIT SINGLE STREAM 1030-1430 ZDC:ZID	03/29/2018 1030	03/29/2018 1430
ZDC	ZNY	ATL J48 10MIT 1030-1800 ZDC:ZNY	03/29/2018 1030	03/29/2018 1800








 Operational STBO Arr/Dep = Departure; Destination has APREQ = Yes; Has AOFF = No; Gate _ □ ×



Search

Clear

Flight ID	Dest	Dep Fix	Swap	AC Type	Gate	EOBT ▲	AOBT	Flight Status	APREQ Requ...	APREQ	EDCT
RPA3401	EWR	KILNS		E170	A13			Scheduled_Out		APRQ	
ASQ5469	LGA	BARMY		CRJ7	A5			Scheduled_Out		APRQ	
AAL655	DCA	KILNS		A319	B2	30/15:29		Scheduled_Out		APRQ	
AAL2064	LGA	BARMY		A320	C19	30/15:34		Scheduled_Out		APRQ	
JIA5545	ATL	BOBZY		CRJ9	E30	30/15:49		Scheduled_Out		APRQ	


Operational STBO Toolbar
>

TM Actions

Create

Show Window

Settings

Delays

Search

Clear

NEW 32

TIME BASED METERING 0800

Conv-S_KR/J/N=18L

18L

18C

Ramp

Operational STBO Timeline Runway 23/5 18L/36R
5
x

Operational

STBO TM Actions

Runway Utilization

APREQ Schedule

MIT Restrictions

Dep Fix Closures

Runway Closures

Ground Stops

Add APREQ

☒ Airport ☐ Jet Route

Airport: Select

Start Time: (dd/hhmm) ☒ Start Now

End Time: (dd/hhmm) ☒ No End Time

Set Constraints
View Constraints

Clear All
Add

APREQ Schedule

Airport	Start ▲	End	Source
EWR	28/1200	1/0230	OIS
LGA	28/1200	1/0230	OIS
DCA	28/1230	1/0230	OIS

Remove

Close Window

NEW 29	APREQ to EWR 1200-0230
--------	------------------------

	— JIA5063 GNV BEAVY
	— ⚡ AAL2064 LGA BARMY APREQ
	— JIA5184 SYR KILNS
55	— JIA5206 LAD KILNS

EWR	0	nm	Dep...
LGA	20	nm	Dep...
JFK	0	nm	Dep...
FRG	0	nm	Dep...
CDW	0	nm	Dep...
MMU	0	nm	Dep...
TEB	0	nm	Dep...
OTHR	0	nm	Dep...

IND
0 nm Dep...

LGA Departure Scheduling

Departure Airports
APREQ Mode
Approval Mode
Scheduling Mode

Departure Airports	APREQ Mode	Approval Mode	Scheduling Mode
BWI	On	Automatic*	Accept
CLT	On	Semi Automatic	Accept
DCA	On	Call for Release*	Accept
IAD	On	Semi Automatic	Accept
RDU	On	Semi Automatic	Accept
RIC	On	Semi Automatic	Accept

ZDC/CP N90 HOLDING ZDC AT RBV FOR LGA DUE TO WX. Fwd by N90/TMU/RM
- LNK: LGA

DL1598 GA
100T 99
B712 280
DAL1598 GA
100T 99
B712 280
ASH625 GA
120T 121
CRJ7 266
LGA

ASH625 GA
120T 121
CRJ7 266
LGA

DAL1428
100T 215
A320 390
LGA

AAL2062
270 C 270
A321 381
LGA

SKW3320
270T 279
E75L 442
LGA

NKS604
270T 350
A320 444
LGA

ENY3323
350 C 350
E145 517
LGA

SWA1890
390 C 390
B737 529
LGA

V3861
D C 350
B737 490
R

DAL2151
350 C 350
A320 317
LGA

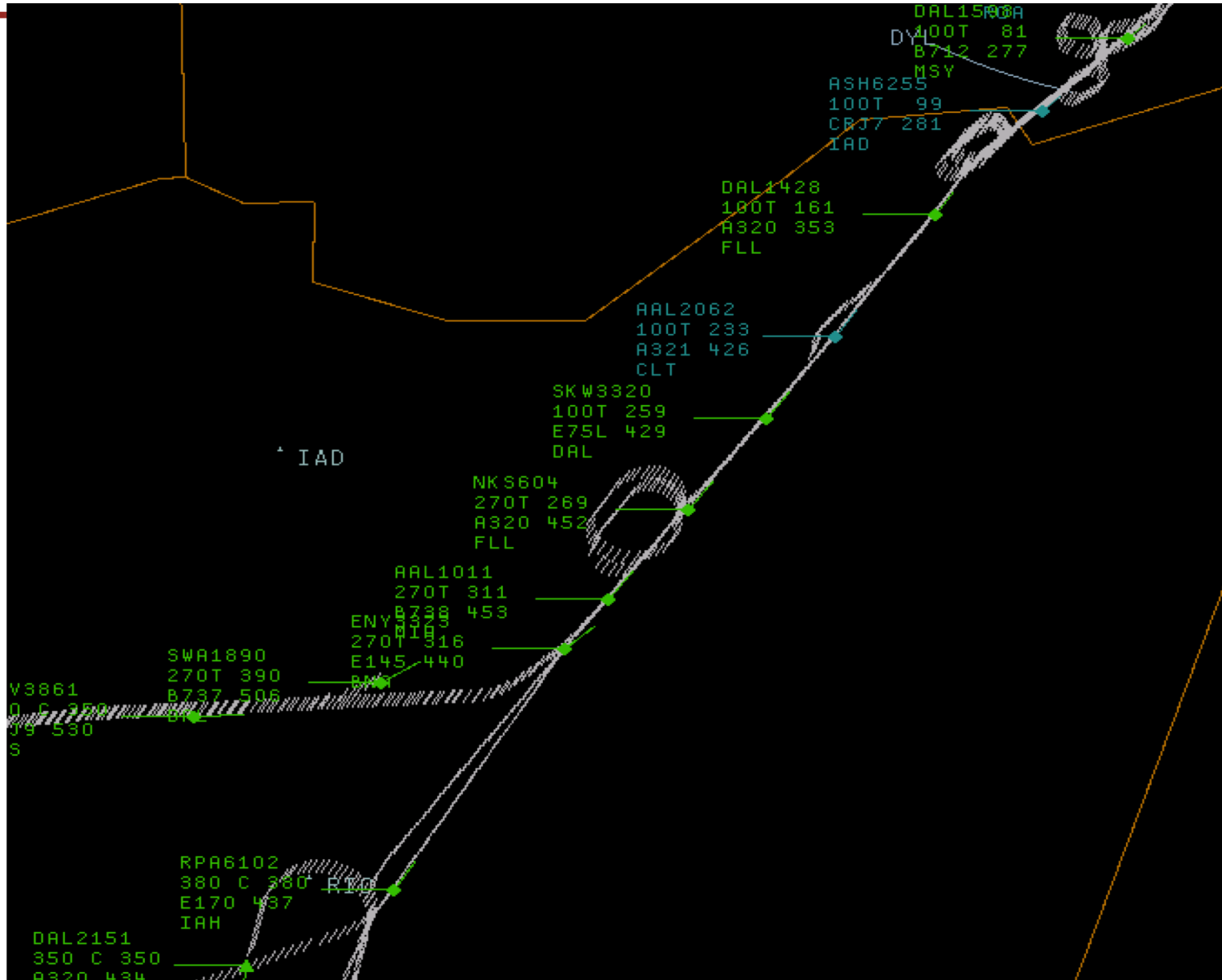
NYC

⊗ CIBAC

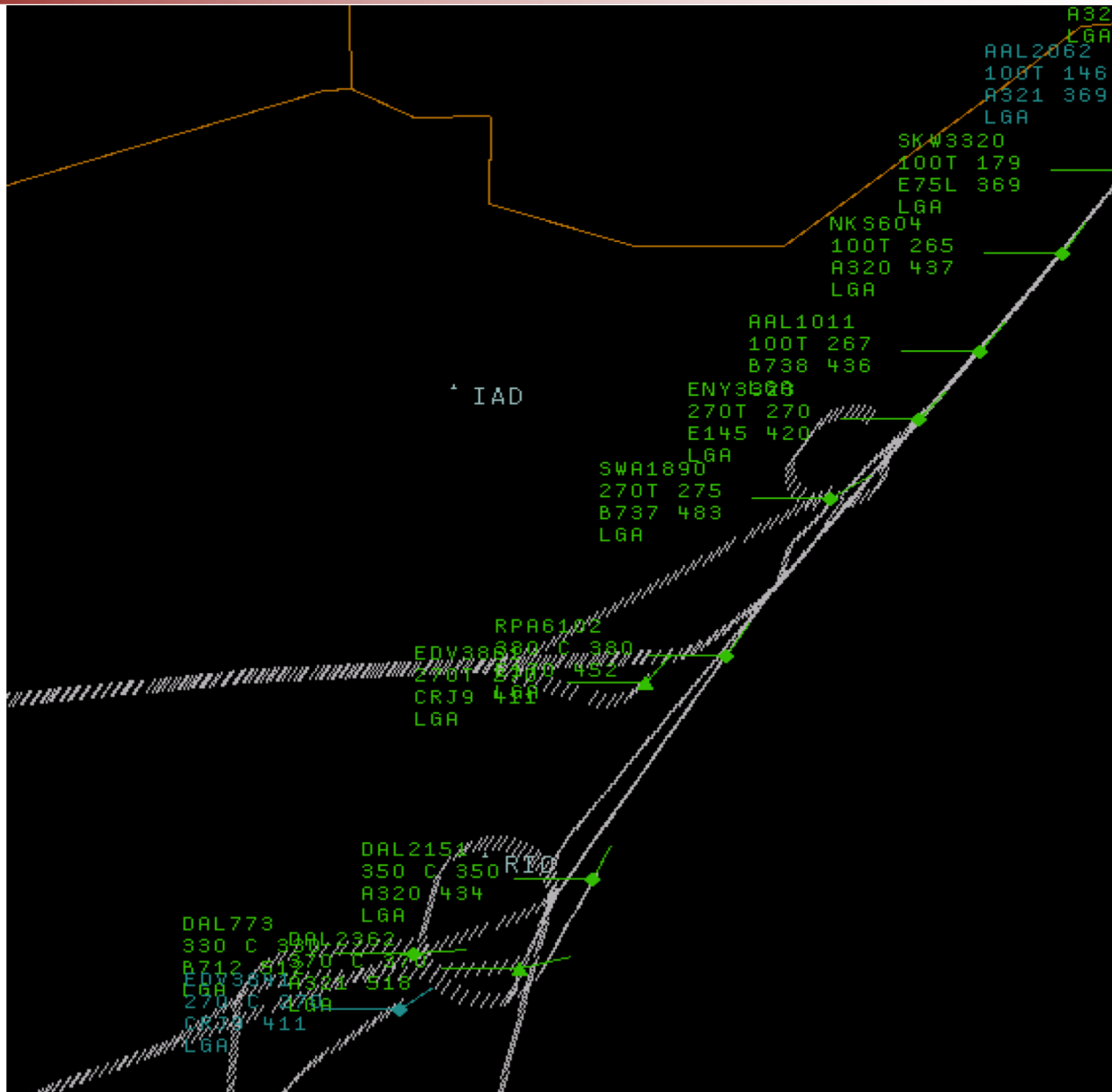
* IAD

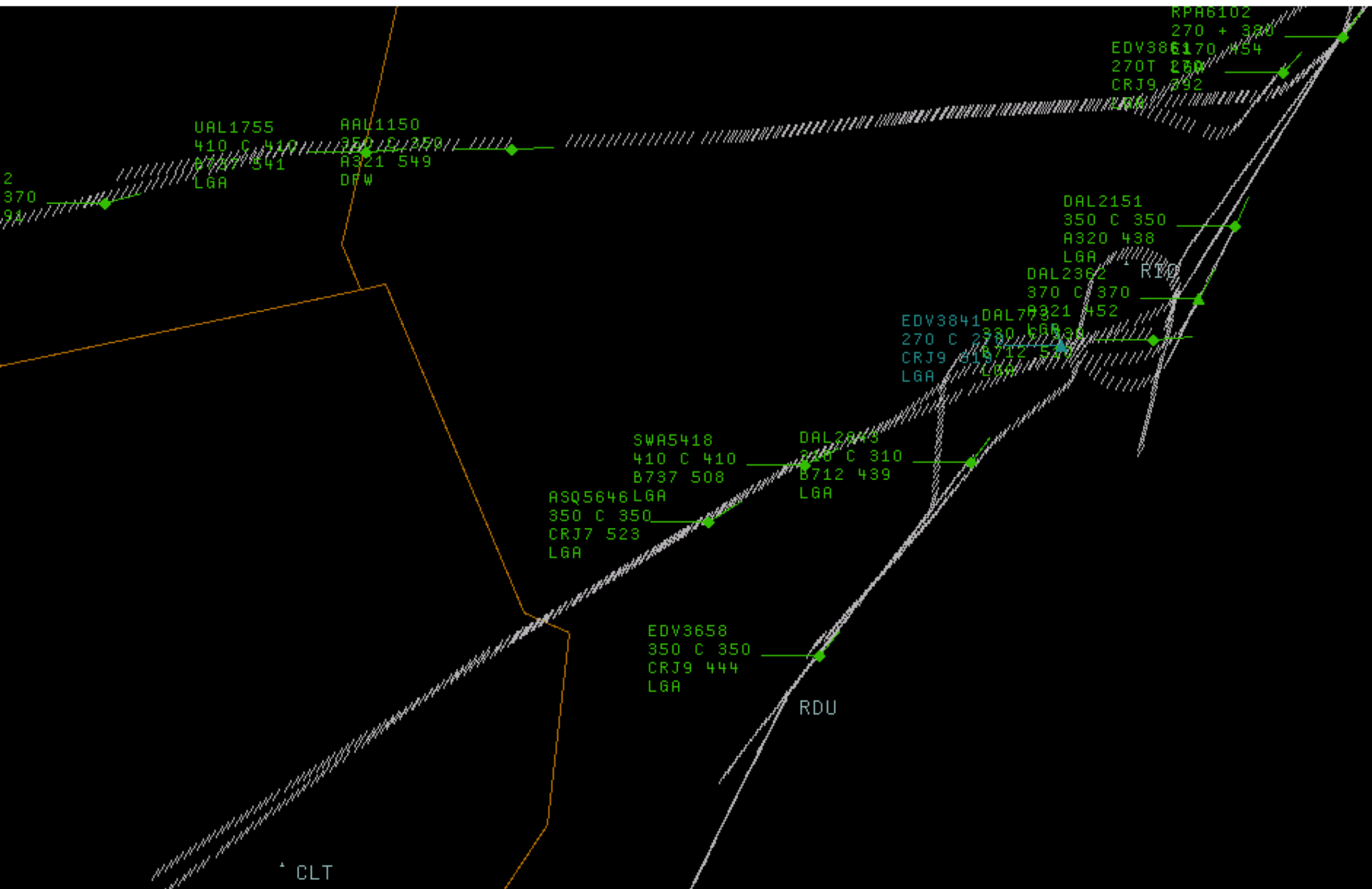
2044 ZDC/CP STOP: ZDC to LGA
2044-2200, WX:Thunderstorms
ZDC:ZDC, STOP: - LNK: LGA - ESIS: CP

Holding For LGA

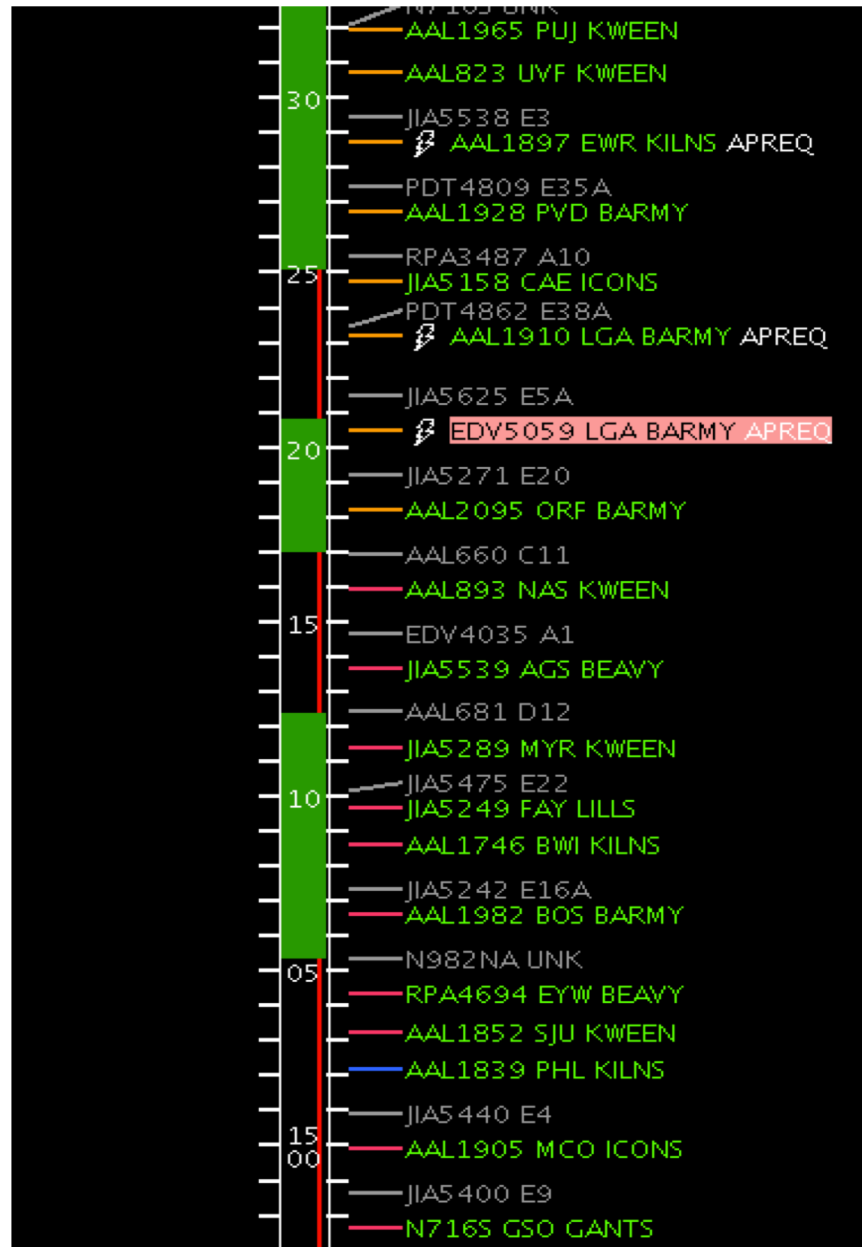


Out of Holding on N90 Boundary

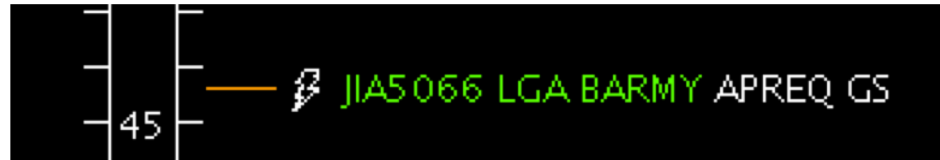




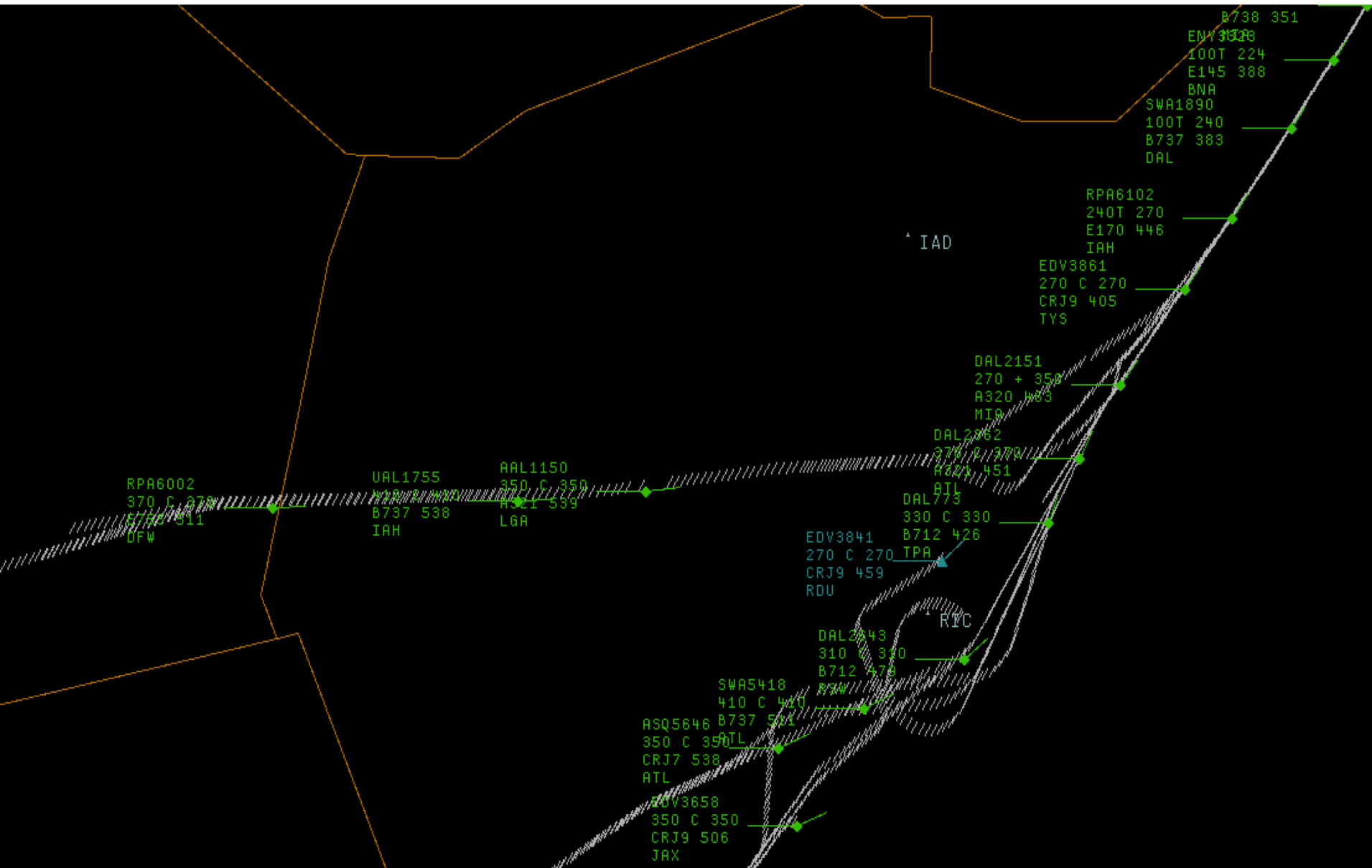
May Not Get Green Space

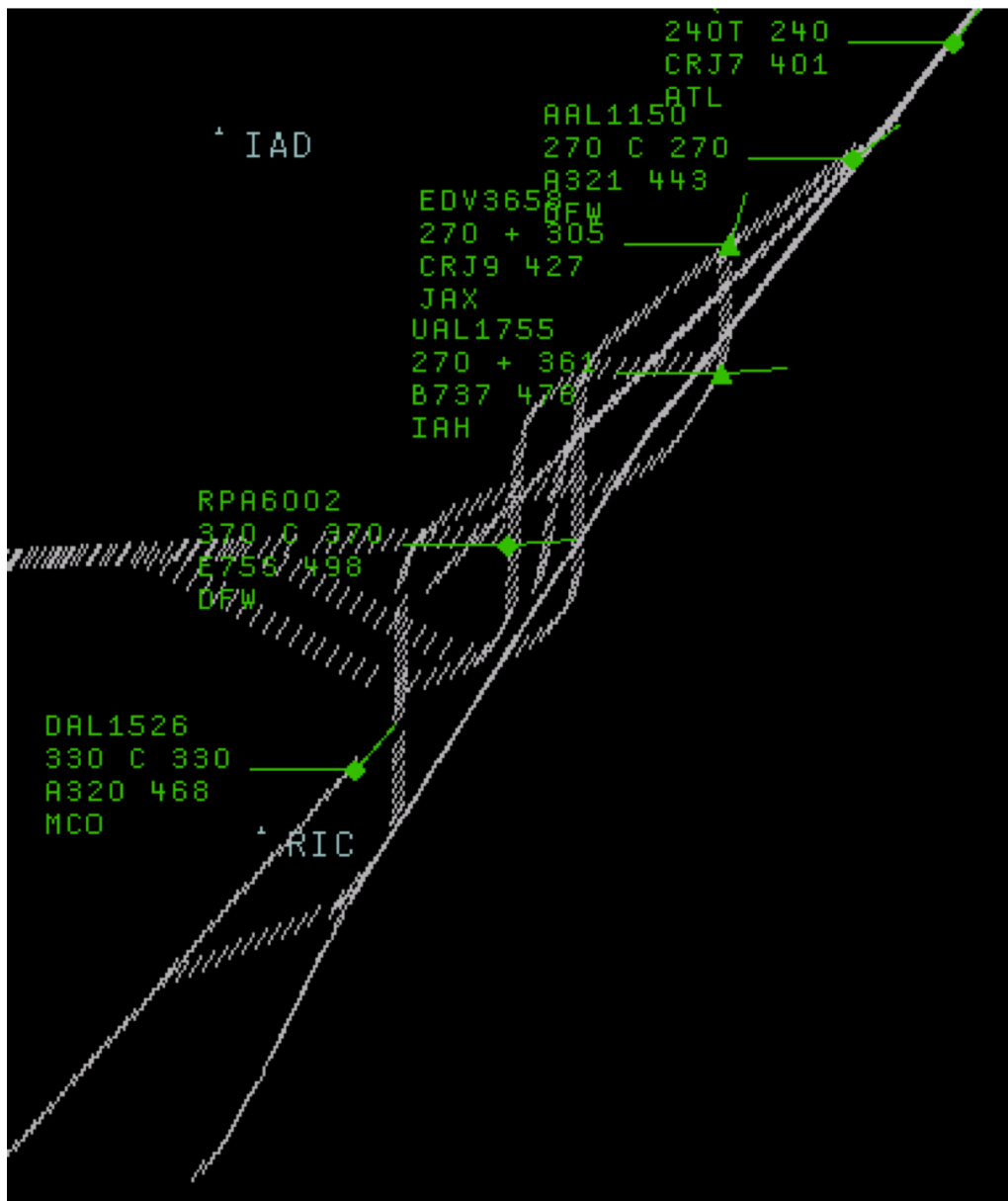


2130 ZDC/CP STOP MODIFIED: LGA 30/2112Z-30/2230Z WEATHER / THUNDERSTORMS
FAC=(Manual), ZAU ZDC ZMP ZBW ZOB ZJX ZMA ZID ZTL ZNY TOT/MAX
/AVE DLY=1230,275,205.0 AAR=35/20/20/15/17/20/22/22/22
RMK:DAL AND THEIR SUBS ONLY DUE TO GATE/TAXI AND WEATHER

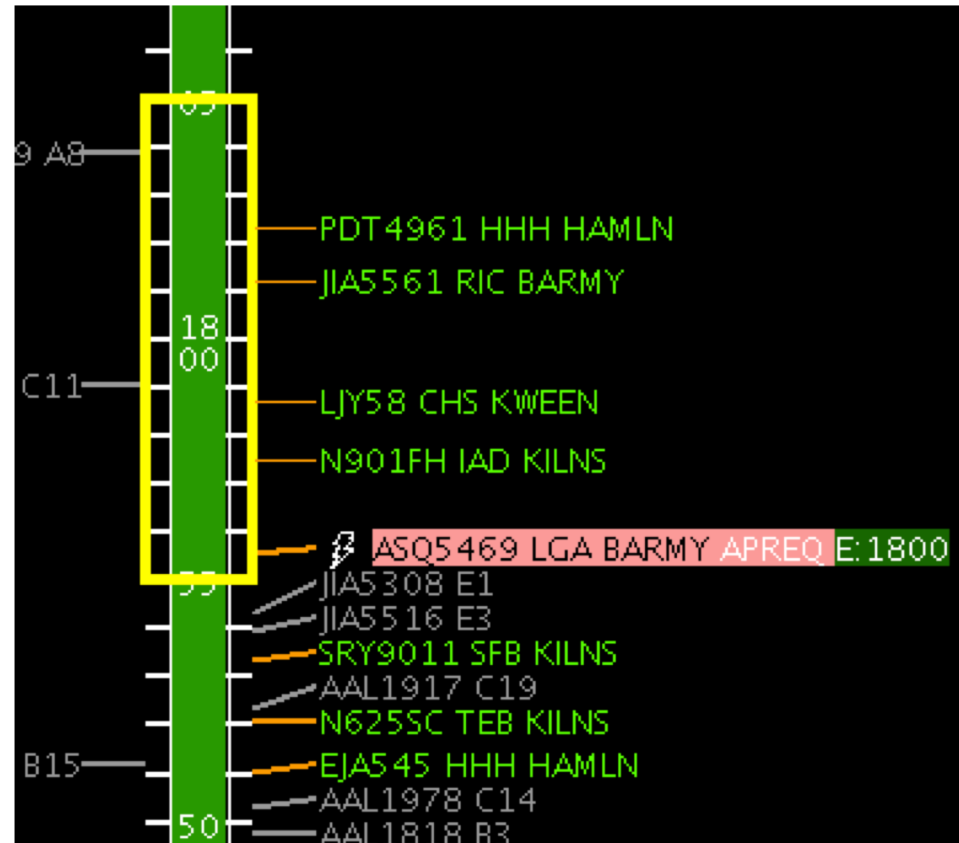


Coming Out of Holding By Richmond





ZDC/CP GDP (UDP) LGA DISTANCE=1450 EXCPT NONE CYHZ CYOW CYUL CYYZ
CYTZ CYQB
EVENT=02/2119Z-03/0259Z, CUMULATIVE=02/2119Z-03/0259Z
WEATHER / THUNDERSTORMS MAX=91 AVG=31.0 AAR=36 PR=36 PF=0
RMK: ZTL GROUNDSTOP CANCELLED. AIRCRAFT RELEASED ON EDCTS.
ARR 04 DEP 13. ADVZY=133 LGA/ZNY 08/02/2016 - LNK: LGA -
ESIS:
CP,Bay1,Bay2,Bay3,Bay4,Bay5,Bay6,Bay7,Bay8,ESP1,ESP2,STMC,SW
MP,MAC,ADS



1753	ZDC/CP	STOP: ZTL via KILNS JETS 1749-2200, WX:Thunderstorms ZDC:ZTL, STOP: APVD 1752/DCC:NE/VI - ESIS: CP,Bay2
1753	ZDC/CP	EnRte via BARMY 15 Mit JETS Excluding: NUTZE AOB FL230/ APREQS 1750-2200, WX:Thunderstorms ZDC:ZTL, RSTN: APVD 1752/DCC:NE/VI - ESIS: CP,Bay2

NTML: ZDC ADMN 01 Mar 2018 1548

Options Edit View Tools Information Print Reports Link Search Help

Count
Delay
EQ
ICE
INFO
MA
Misc
MRSTN
MyEntry
PIREP
RSTN
RWY
SISO
SUA
Sum
SWAP
Telcon
[Log](#)
Pending

Benjamin Dengler

Request Type: ☒ Initiate ☐ Modify ☐ Cancel ☐ Delete

Entry Time: 1548 ☐ Clear on Submit

Type: MIT: 15

Aircraft Type:
☐ All ☒ Jet ☐ Prop ☐ Other:

Requesting: ZDC

Providing (/): ZTL

Start Time: 1230 End Time: 1630 Causal Factor... WX:Thunderstorms

Altitude:

Speed:

Restriction:
☒ En Route ☐ Departure ☐ Arrival

Qualifier (/): AS ONE

Exclusions:

Airport (/):

Via (/): KILNS/BARMY

Location (/):

☐ Severe Weather Reroute

Justification/Remarks:

ATCSCC Remarks/Critique:

Send To... ESIS: CP,Bay2

Coordination Complete ☐

Pos:

Reminder (/):

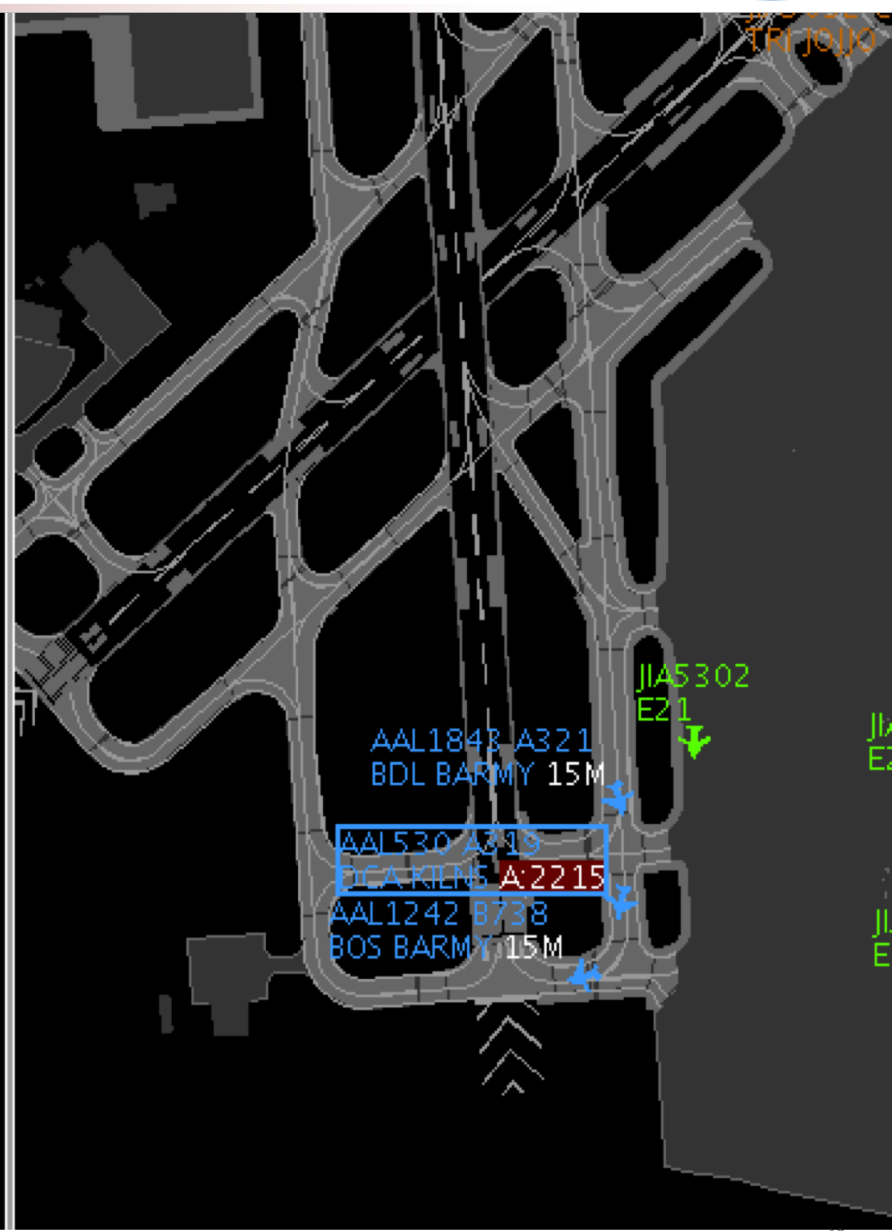
Fac:

Entry #:

Submit Spelling Clear Save As

TPCOPS Pending: 16 / 1

40	— AAL2784 BDL BARMY 15M
	— JIA5483 E17
	— AAL2052 PWM BARMY 15M
	— PDT4826 E35C
	— AAL730 H LHR BARMY 15M
	— N285BA UNK
	— JIA5424 GSO GANTS
35	— ⚡ AAL1740 LGA BARMY APREQ 15M
	— JIA5282 E25
	— JIA5593 MYR KWEEN
	— JIA5131 SAV ICONS
	— DCM4096 UNK
30	— AAL609 MIA ICONS
	— N692L UNK
	— ⚡ EDV3772 LGA BARMY APREQ 15M
	— JIA5575 CAE ICONS
	— JIA5145 E15
25	— ☎ AAL869 PHL KILNS APREQ
	— AAL1457 B4
	— JIA5387 AGS BEAVY
	— AAL1962 D4
	— EDV3775 JFK BARMY 15M
20	— EJA787 UNK
	— AAL1723 RIC BARMY 15M
	— ASH6166 A11
	— AAL1871 TPA BEAVY
	— LXJ456 UNK
	— BBT4785 BDL GANTS

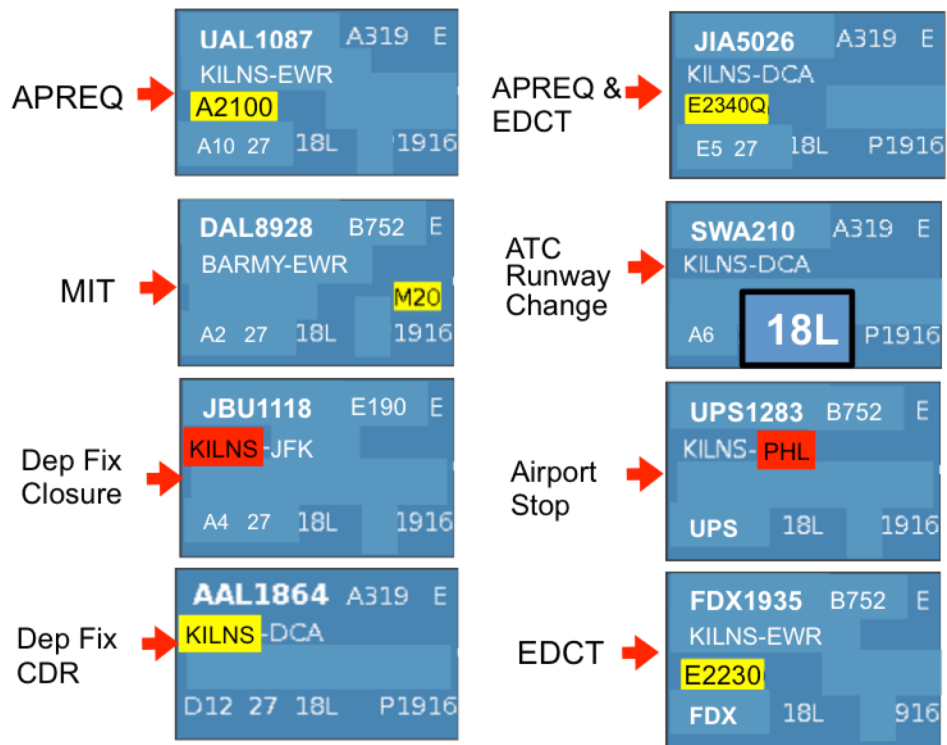


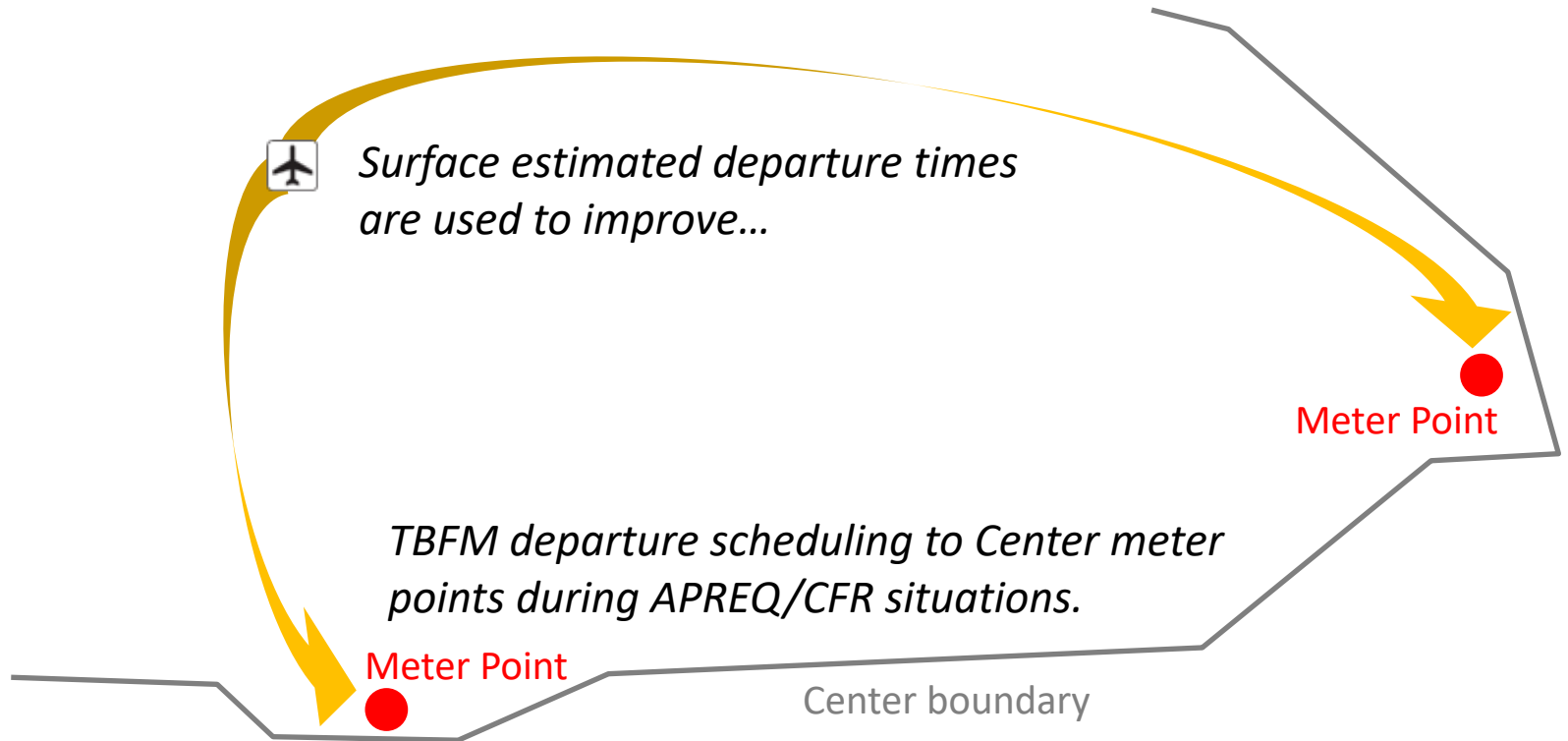
KILNS Swapping to BARMY

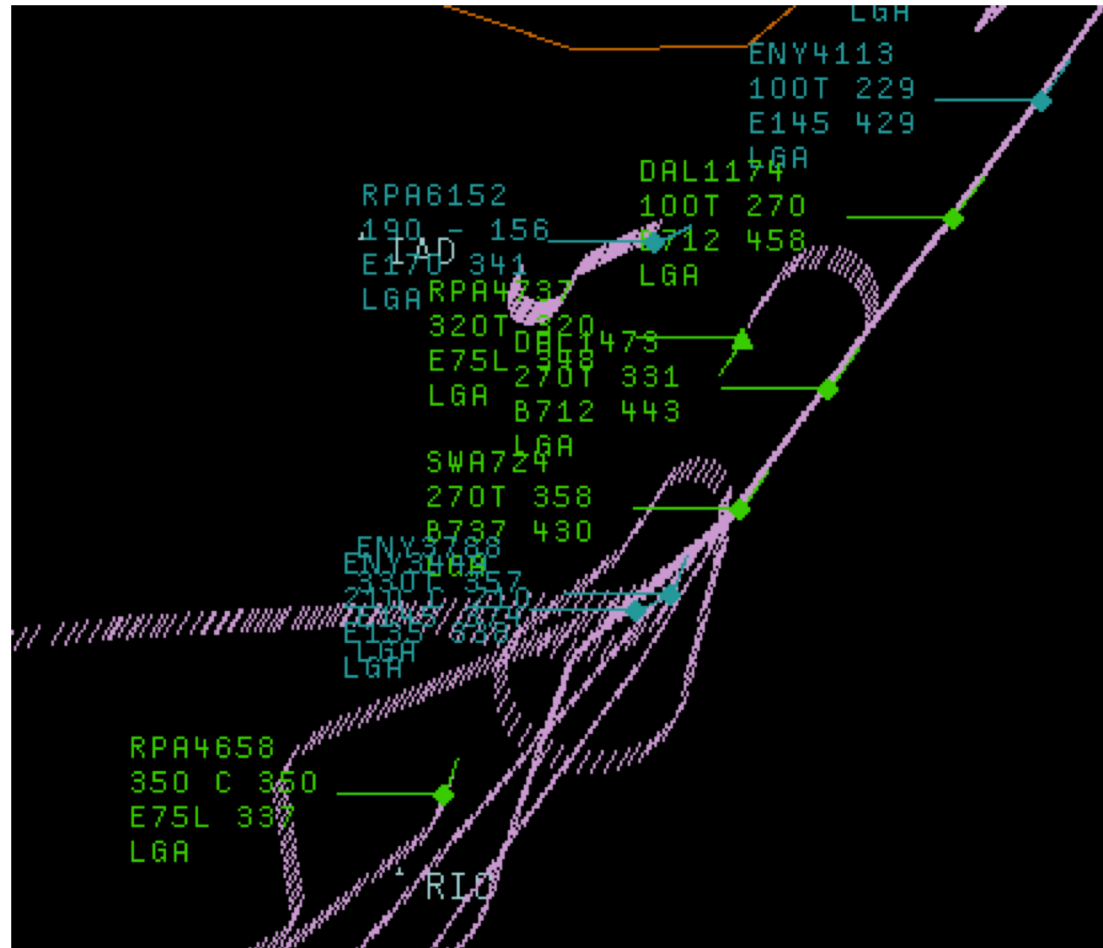


—	JIA5575 CAE ICONS
—	JIA5483 E17
—	EDV3772 LGA BARMY APREQ 15M
—	EJA787 UNK
—	AAL869 PHL KILNS->BARMY APREQ 15M
—	AAL1962 D4
—	JIA5387 AGS BEAVY
—	ASH6166 A11
—	EDV3775 JFK BARMY 15M
—	LXJ456 UNK
—	AAL1723 RIC BARMY 15M
—	JIA5145 E15
—	AAL1871 TPA BEAVY
—	AAL1457 B4
—	PDT4795 ROA GANTS
—	AAL1998 JAX ICONS
—	AAL1663 C19
—	AAL2043 ORF BARMY 15M
—	AAL1703 C7
—	AAL1861 RDU LILLS
—	SRY1191 UNK
—	JIA5377 CHS KWEEN
—	PDT4952 FLO LILLS
—	AAL1750 DCA KILNS->BARMY APREQ 15M
—	AAL1066 D5

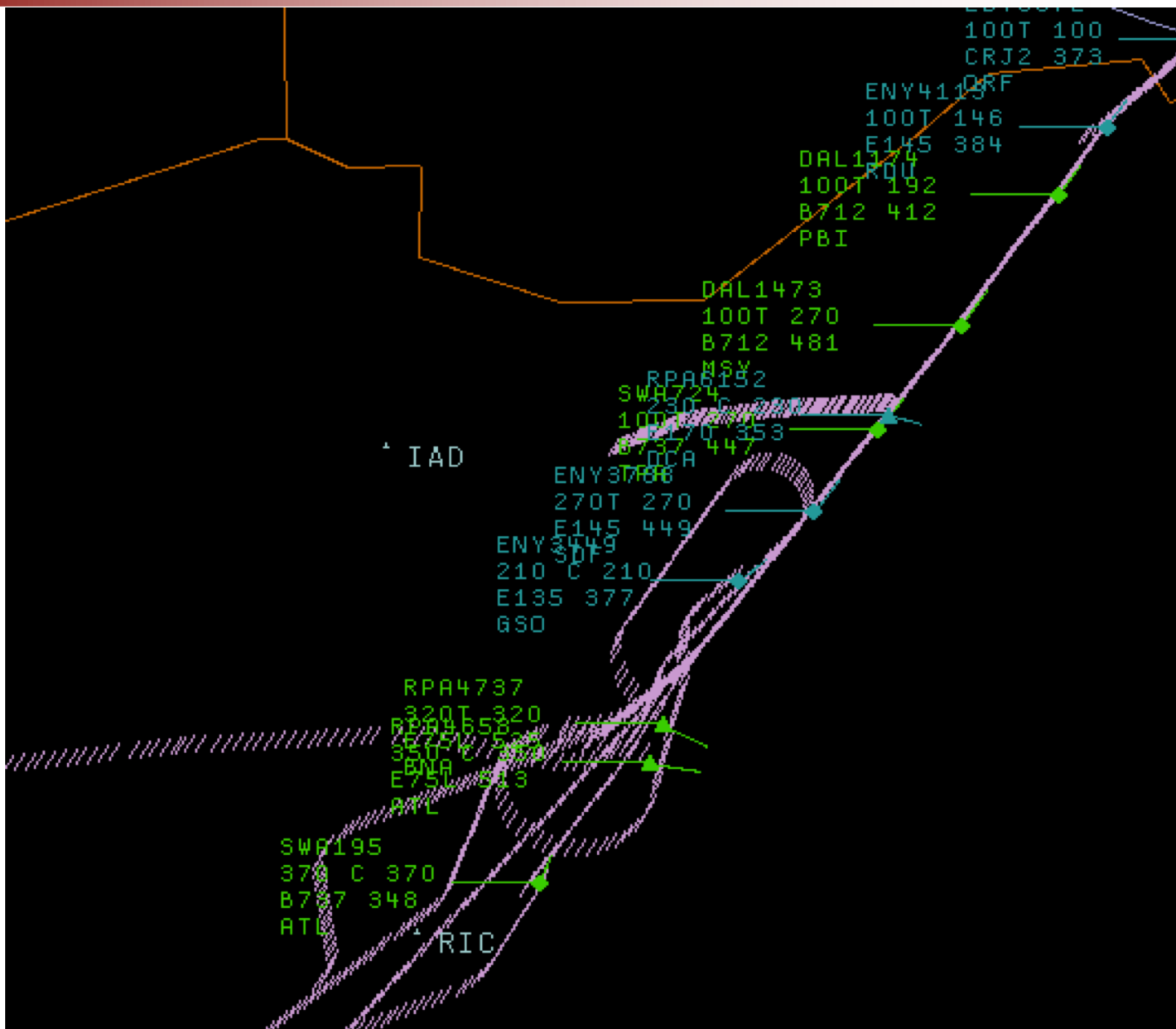


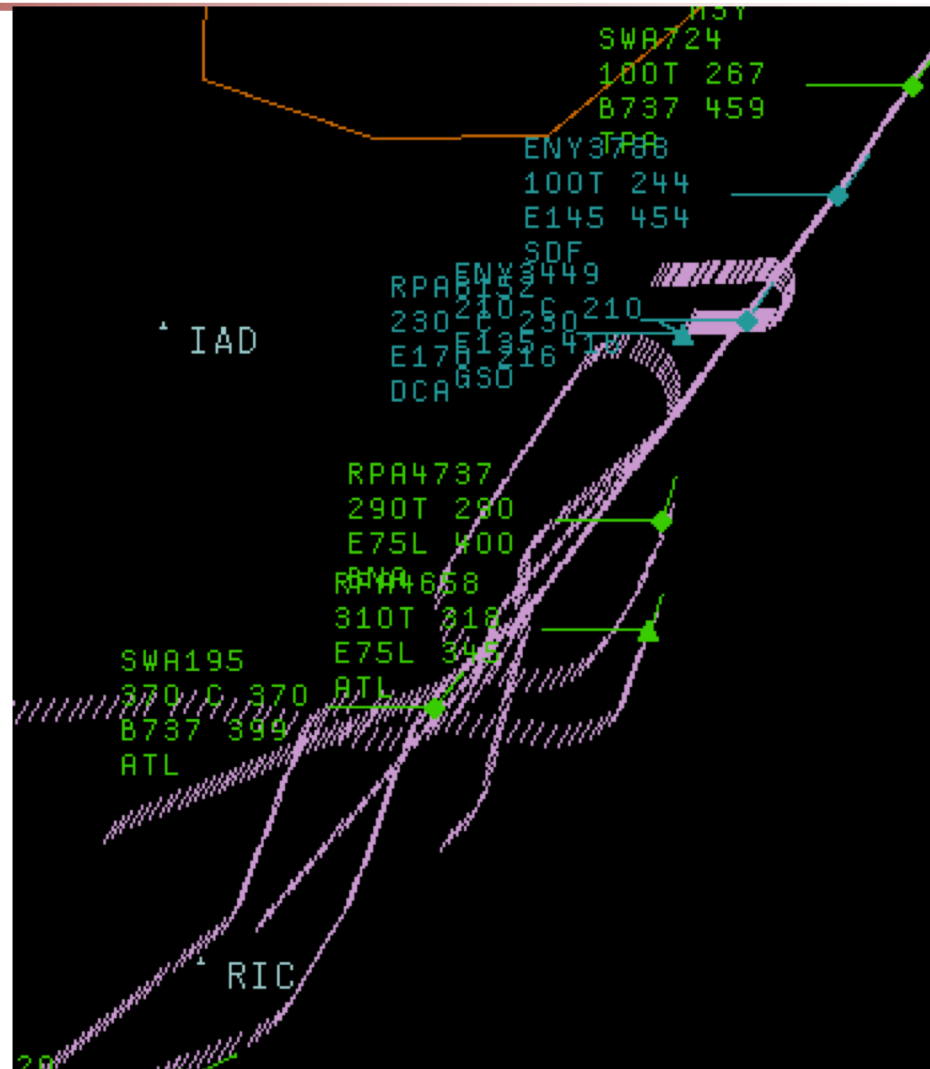




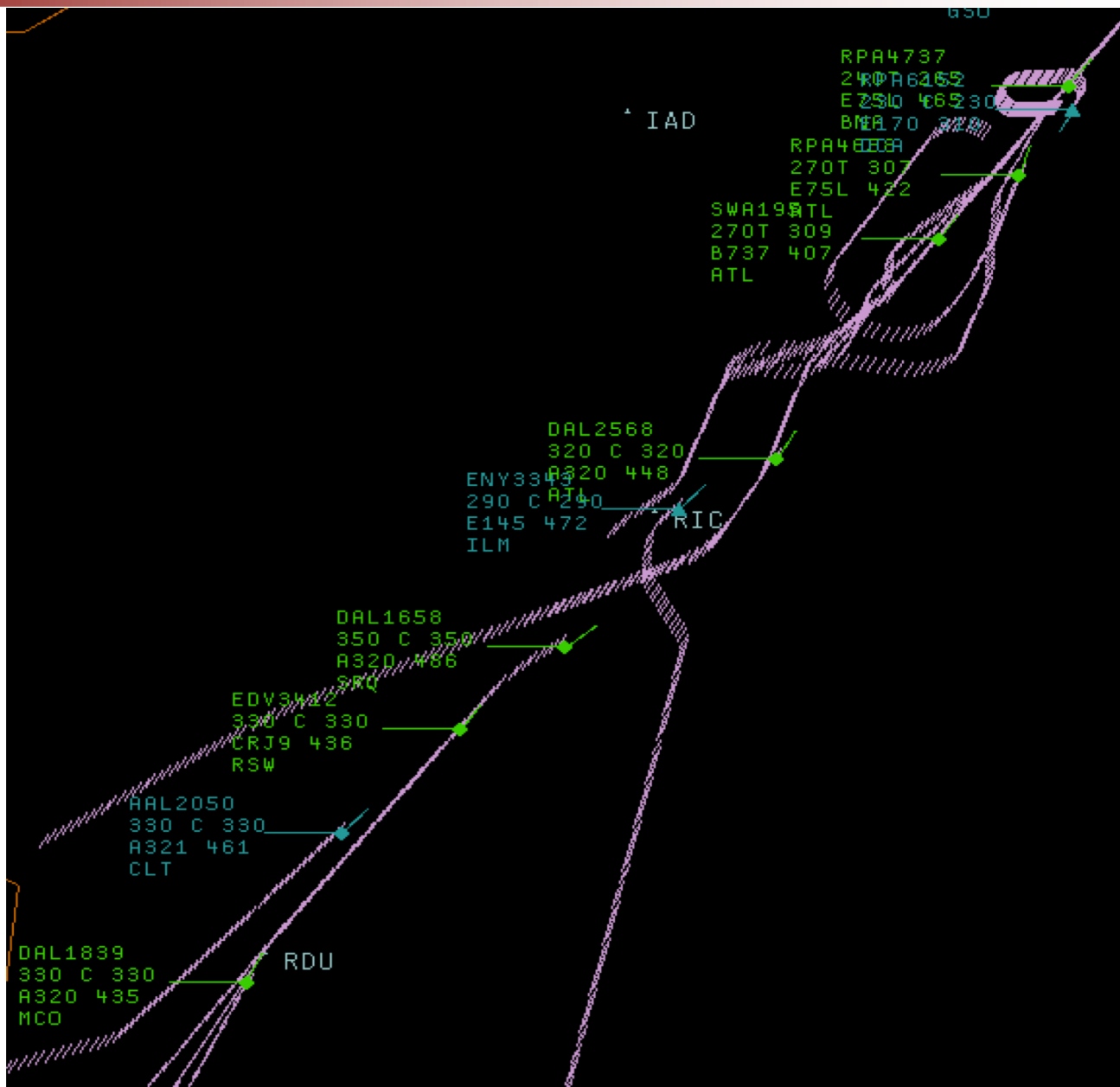


Non-Compliant APREQs

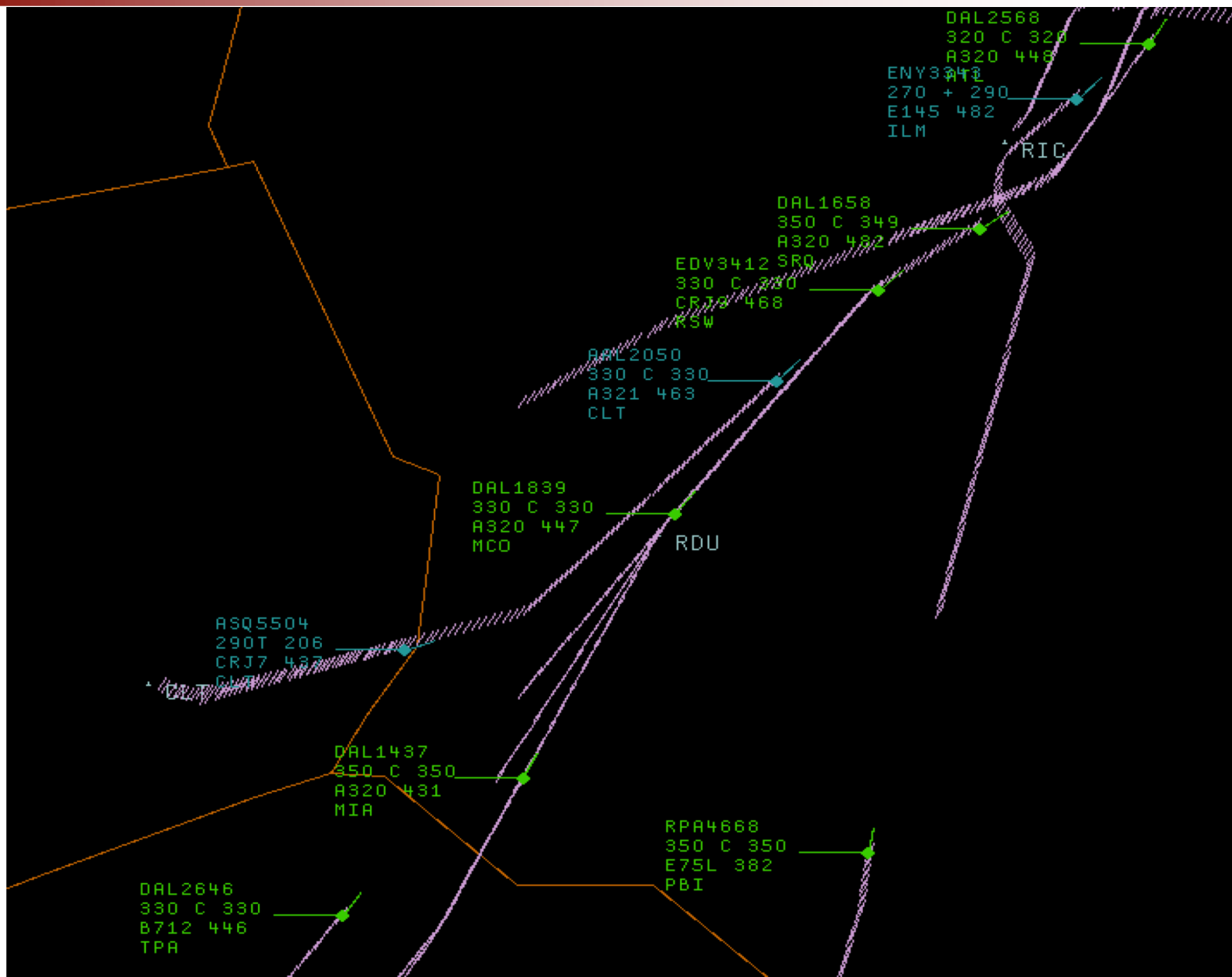


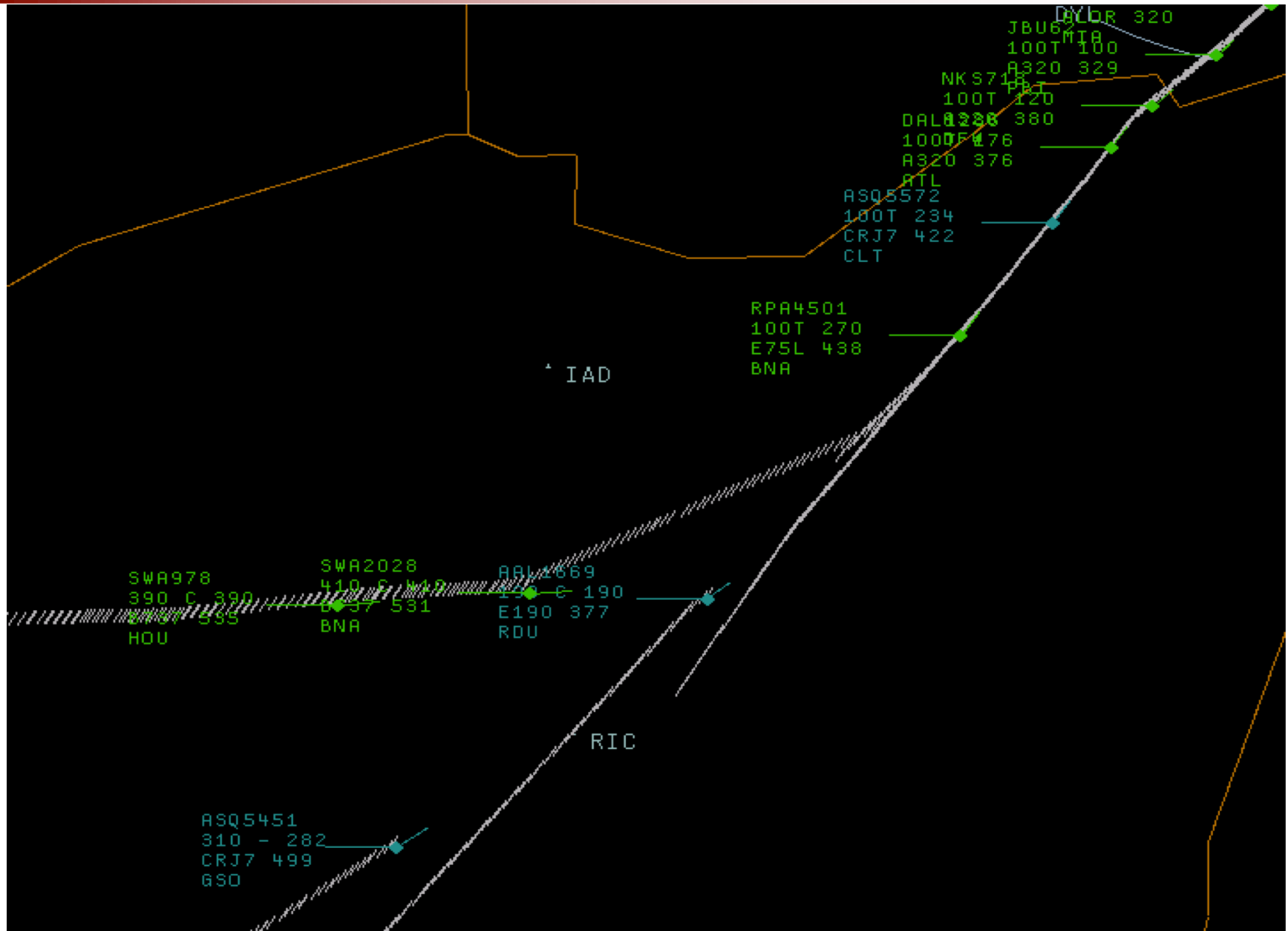


Consequences of Bad Releases RDU departure delayed 46 minutes

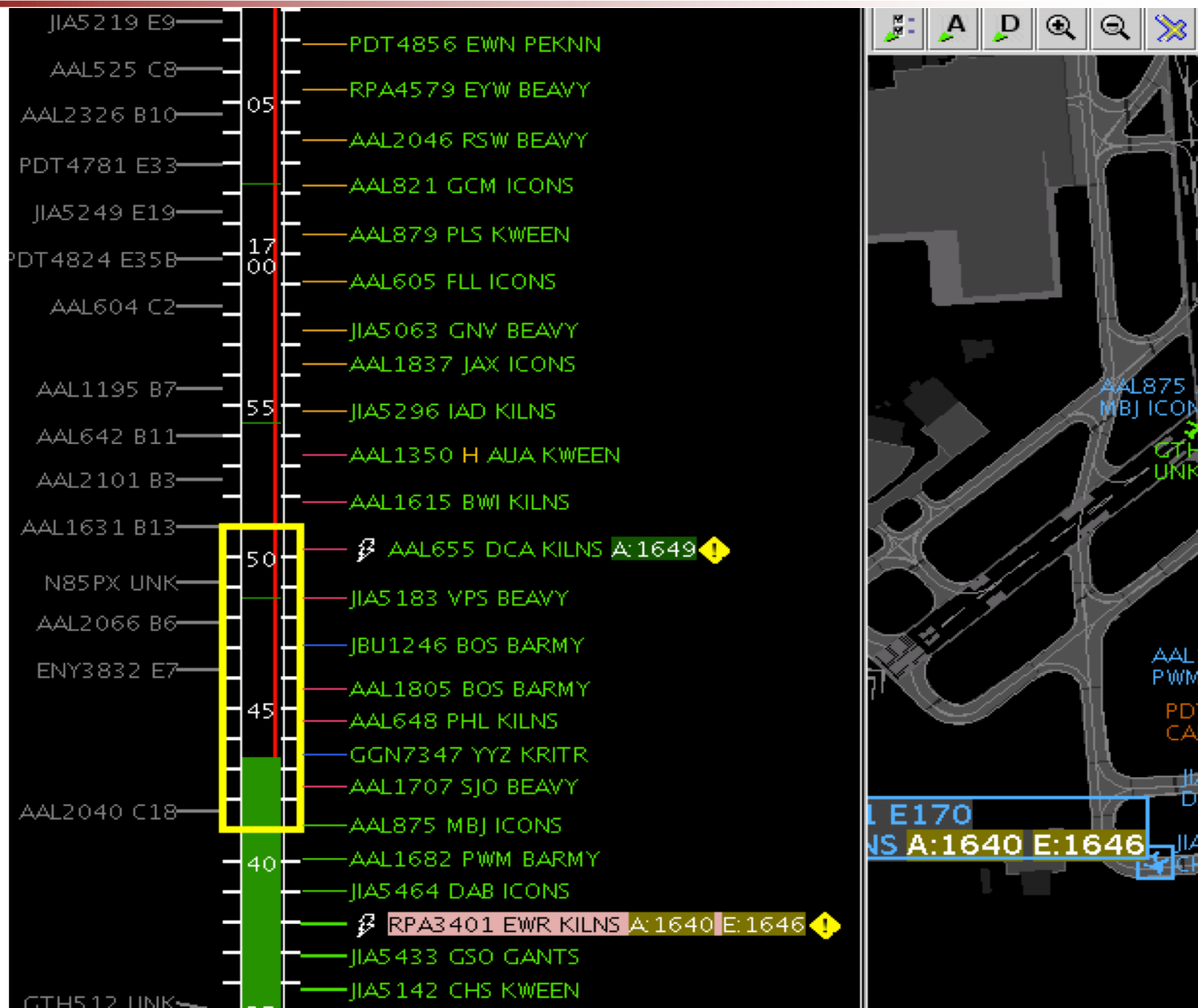


Came Out of Hold Before Next Flow Arrived



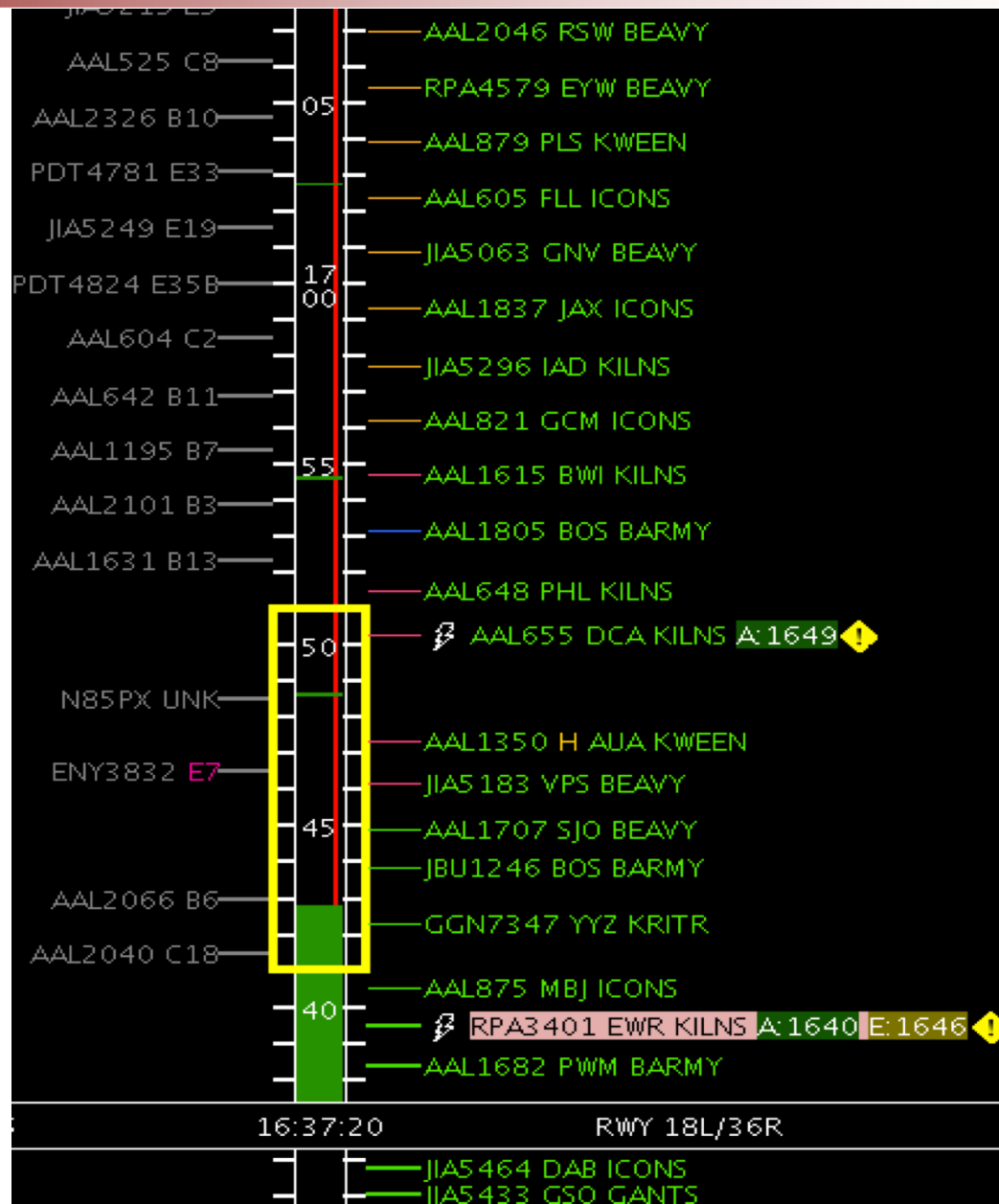


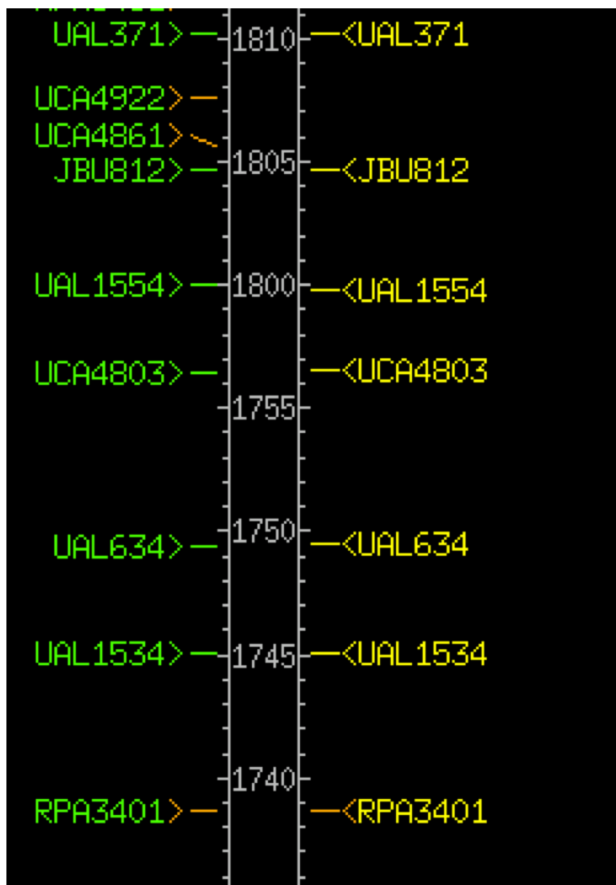
APREQ/EDCT Window/Slivers of Green





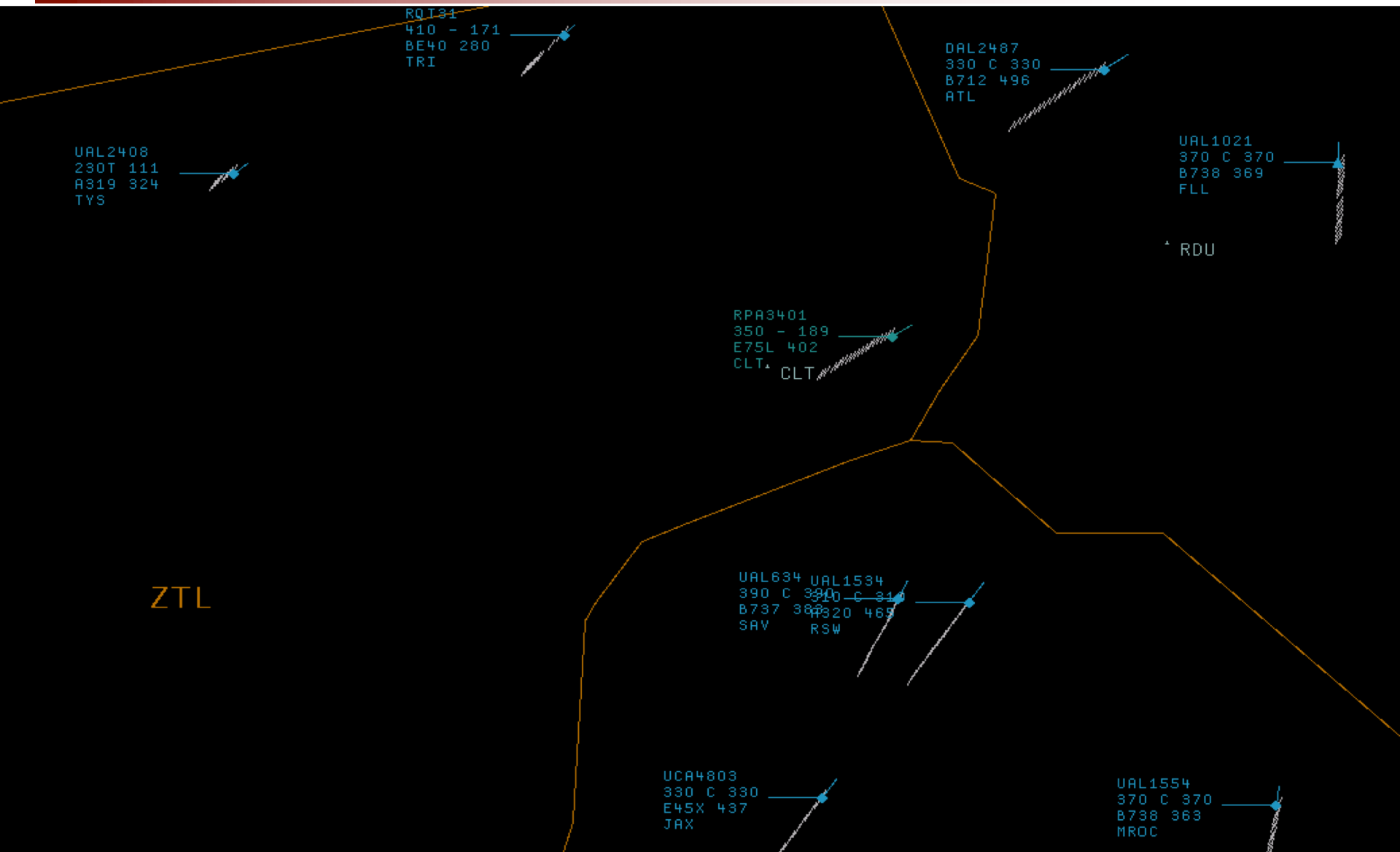
On Time Departure

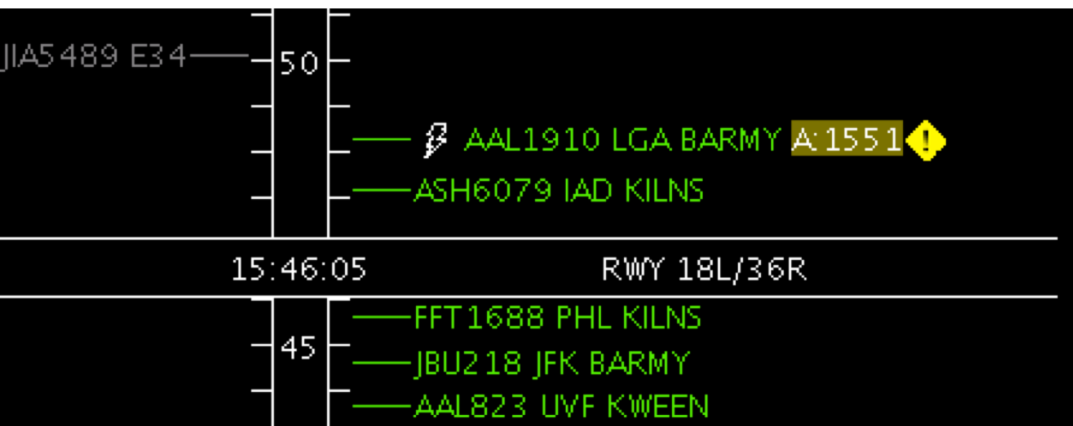






RPA3401 Departing CLT





Highlight Shows only Red Space



	<p>— AAL1910 LGA BARMY A:1551 </p> <p>— ASH6079 IAD KILNS</p>
<p>15:46:55</p>	<p>RWY 18L/36R</p>
	<p>— FFT1688 PHL KILNS</p>

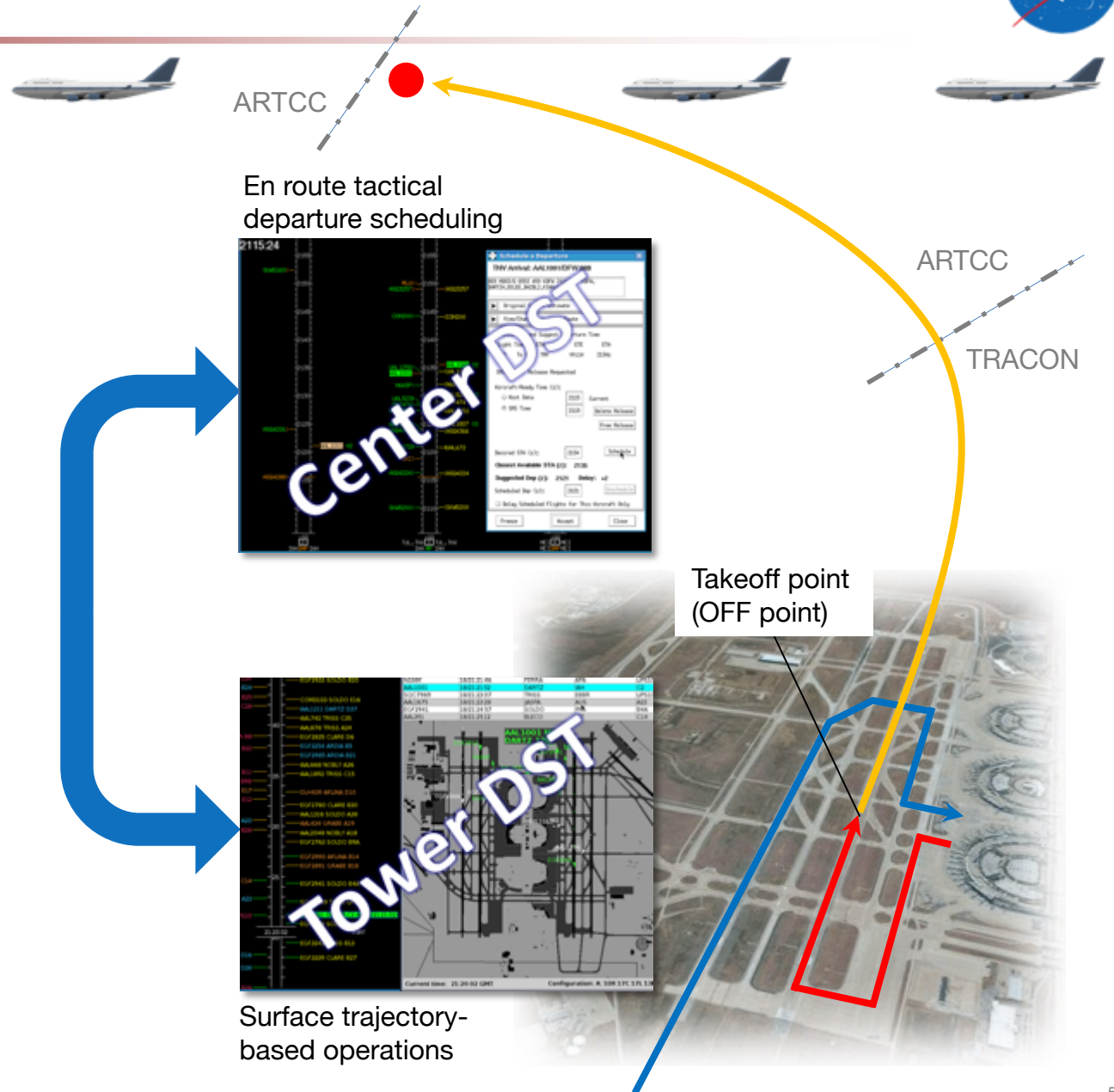




- Backup

En route system uses information from surface system for more precise tactical departure scheduling.

Surface system predicts OFF times and runway assignments for use by the en route scheduling system.



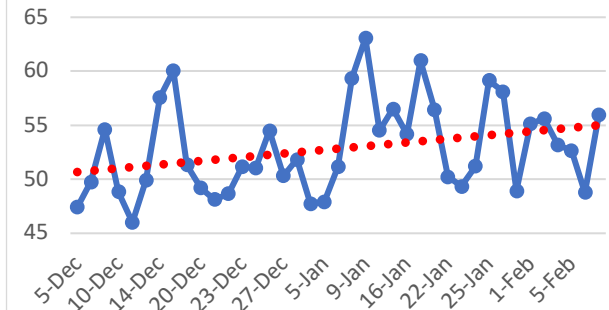
Brian Briefs on How data is and will be scraped into STBO



22.5 hours of delay saved by electronically renegotiating a better overhead stream time for over 172 flights. Trending upward.

42,824 lbs. of fuel saved by scheduling APREQs at gate. Trending upward.

Fuel Saved Per APREQ Flight Scheduled at Gate - Increasing Over Time

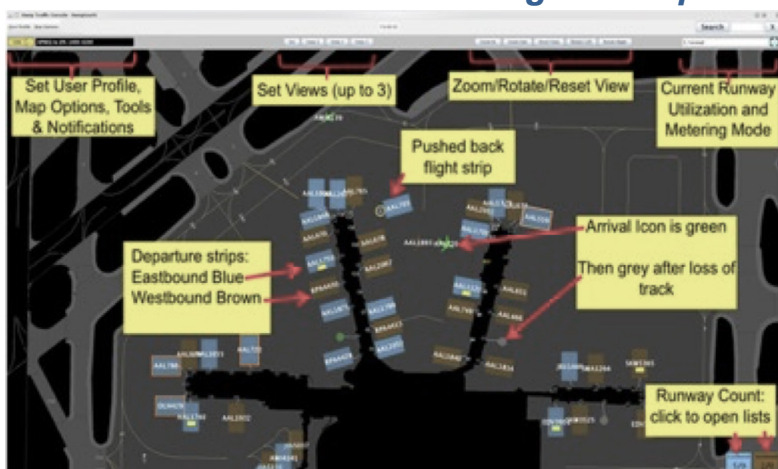


Flight ID	Dest	Dep Rte	Swap	AC Type	Gate	EOBT ▲	AOBT	Flight Status	APREQ Reqs	APREQ	EDCT
PR27565	ENR	KILNG		E170	A10		09/12 54	S. Cruise		1407	
AO55570	LCA	BAMFY		CRJ7	A1			Scheduled Out		APRQ	
AA11625	DCA	KILNG		A320	A4	09/14 20		Scheduled Out		APRQ	
9A9828	DCA	KILNG		CRJ2	E11	09/14 20		Scheduled Out		APRQ	

- The benefits described here are associated with better use of existing capacity in the overhead stream, and technology to reduce surface delay.
- These benefits are in addition to (distinct from) surface metering savings.

ATD-2 is a **field demonstration** that evaluates the benefits of **wholistic consideration** of arrival, departure and surface (**IADS**) traffic flows while introducing new technologies and procedures into its **collaborative operational environment**

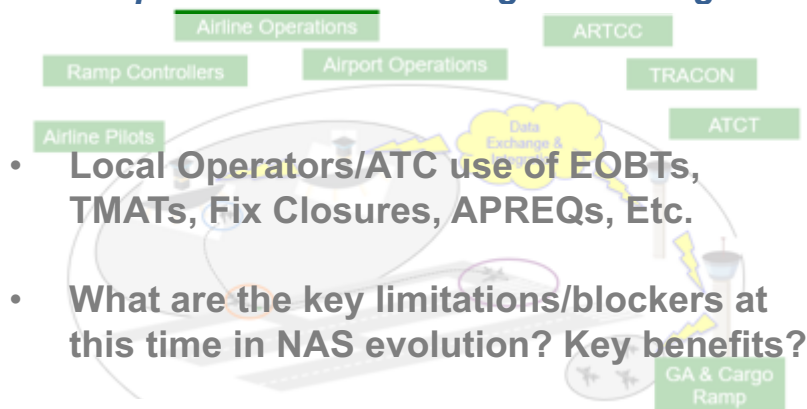
Collaborative Surface Metering w/Ramp Tool



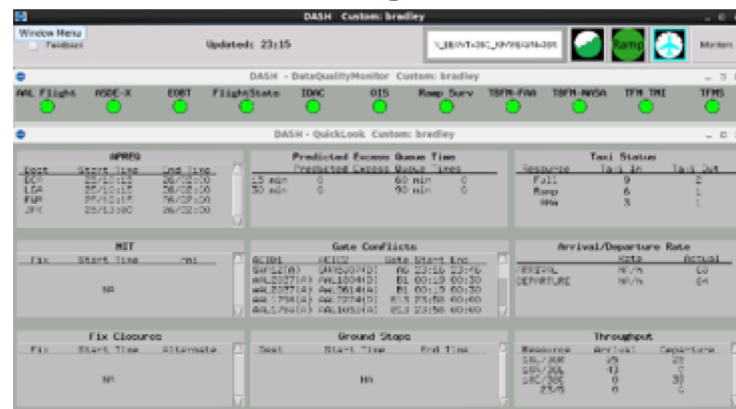
Overhead Stream Operational Integration



ATC/Operator Data Exchange and Integration



Collaborative Planning the Real-Time Flow




NTML: ZDC ADMN 08 Feb 2017 1658

Options Edit View Tools Information Print Reports Link Search Help

Count
Delay
EQ
ICE
INFO
MA
Misc
MRSTN
MyEntry
PIREP
RSTN
RWY
SISO
SUA
Sum
SWAP
Telcon
Log
Pending

00 Benjamin Dengler Request Type: ☒ Initiate ☐ Modify ☐ Cancel ☐ Delete
Entry Time: 1657 ☐ Clear on Submit

Type:  APREQ:

Aircraft Type:
☒ All ☐ Jet ☐ Prop ☐ Other:

Requesting: ZDC
Providing (/): ZTL/CLT
Start Time: End Time: Causal Factor...

Restriction:
☐ En Route ☒ Departure ☐ Arrival

Altitude:
Speed:
Qualifier (/): NONE
Exclusions:
☐ Severe Weather Reroute

Airport (/):
Via (/): BARMY/KILNS
Location (/):

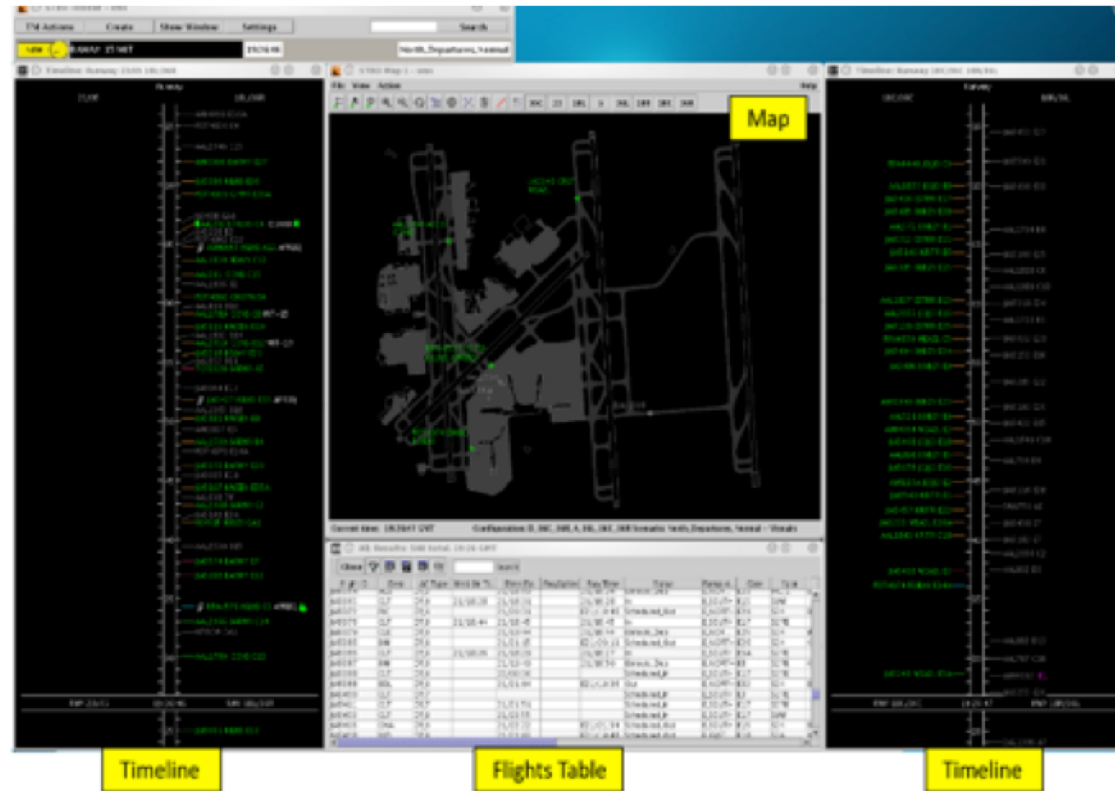
Justification/Remarks:
PLEASE APREQ WITH ZDC

ATCSCC Remarks/Critique:

Send To... ESIS: Coordination Complete ☐
Pos: Reminder (/):
Fac: Entry #:

Submit Spelling Clear Save As

TPCOPS Pending: 46 / 0



- Show Airspace and STBO from INT 10 and 12